

A
COMPENDIUM
OF
PRACTICAL ARITHMETIC,

BY
JOHN THOMAS HOPE,
LATE MASTER OF THE ACADEMY,
CALCUTTA,

The Second Edition.

REVISED AND CORRECTED,

WITH
ADDITIONS,

BY
WILLIAM MACLEOD.

ARITHMETIC is the easiest, and consequently the first sort of abstract reasoning which the mind commonly bears, or accustoms itself to; and is of such general use in all parts of life and business, that scarce any thing is to be done without it. *Locke on Education.*

Calcutta :

PRINTED AT THE HINDOOSTANEE PRESS,
BY A. H. HUBBARD.

1810

DEDICATION.



TO

THE RIGHT HONORABLE

GILBERT LORD MINTO,

Governor General, &c. &c. &c.

MY LORD,

WITH the greatest deference, I beg leave to entreat your Lordship's protection to the following Compendium of Mercantile Arithmetic, entirely adapted in its calculations, for the use of students of that science in this country; humbly soliciting that it may receive the sanction of your auspicious patronage, and trusting from your known candour in encouraging every useful improvement, that your Lordship will be pleased to distinguish this work with your approbation.

I AM, MY LORD,

YOUR LORDSHIP'S MOST OBEDIENT,

AND VERY HUMBLE SERVANT,

WILLIAM MACLEOD.

CALCUTTA, 7th FEBRUARY, 1809.

SUBSCRIBER'S NAMES.



The Rt. Hon. Gilbert Lord Minto, One copy.



A.		Cheese, Michael Esq.	
	<i>Copies.</i>		
Alexander and Co.	1	Charters, James	1
Alexander, Henry Esq.	1	Crisp, Burrish Esq.	1
Alcantara, H.	1	Cust, Capt. Charles B.	1
Arnold, John	1	Culloden, William	1
B.		D.	
Baretto, Joseph and Co....	1	Daverson, J. H. S.	1
Barons, B.	1	Davies, C. M.	1
Bell, William	1	DaCruz, John	1
Blagrave, Anthony Esq. ...	1	DeLisle, Lieut. Nicholas...	1
Brightman, Edward	1	DeVerger, J. B.	1
Bruere, Fred'k St. Georges.	1	DeRozario, Michael	1
C.		Dexter, Christopher	1
Count Lally	1	Dormieux, F.	1
Campbell, Alexander Esq. ...	1	Dolby, William	1
Cardozo, John	1	Drenning, H. H. ...	1
Carrapit, P.	1	E.	
Carpenter, F. J.	1	Egerton, W. Esq.	1
Colvins, Bazett, and Co....	1	F.	
Collett, Thomas	1	Fairlie, Gilmore, and Co. ..	1
Cornelius, Lewis	1	Farrell and Lathrop,	1
Cooke, Henry	1	Fergusson, Benjamin Esq. ...	1
Coombs, William and Co... 1			

SUBSCRIBER'S NAMES.

Ferris, P.	1	Hunter, W. M. D.	1
FitzGerald, H.	1	Hutteman, George Samuel .	2
Fraser, Edward	1	Hudson, C.	1
Fritz, John.	1		
		J.	
G.		Jacobi, Henry	1
Gardner, Ann.	1	Johnson, John.	1
Gea, William	1		
Gibson, Son, and Knox.	1	K.	
Gould, Son, and Campbell. .	1	Knox, Wm. Carnegie	1
Gouldhawke, Nat. Henry. .	1		
Golborne, Robert	1	L.	
Grant, Wm. Lloyd Esq. .	1	Larkins, J. P. Esq.	1
		L'Aimou, John	1
H.		Loy, Captain Thomas.	1
Hayes, Captain John	1	Lewis, Simpson and Wallace	1
Hampton, S. Esq.	1	Leonard, Owen	1
Harrison, John	1	Leech, Captain William ...	1
Harvey, Henry	1	Linstedt, Frederick	1
Hammon, W.	1	Linstedt, Chas. Wm.	1
Harwood, J.	1	Lidiard, Thomas.	1
Habberley, R.	1	Lloyd, Thomas, Sect. Dept.	1
Hamilton, Joseph Esq.	1		
Heberlet, Andrew	1	M.	
Henderson, W.	1	Maclean, Sinclair, and Co.	1
Henderson, John	1	Mackintosh's, Falton} and	
Higgins, John.	1	McClintock	1
Hodgkinson, Esq. R.	1	Mactier, A. Esq.	1
Hope, Hugh Esq.	1	Martindell, Henry	1
Hollings, William Esq.	1	Marston, S.	1
Howard, Robert	1	Madeo, J. D.	1
Howard, John	1	McKenzie, Wm.	1
Holst, John Esq.	1	McLean, John	3
Hogue, Davidson, and Co. .	1	McDougal, Mrs.	1
		Meyers, and Co.	1

SUBSCRIBER'S NAMES.

Miller, Captain T. 1	Rogers, Bernard 1
Michael, Hick 1	S.
Mills, John Sr. 1	Saunders, B. H. Esq. 1
Mills, John Jr. 1	Samuel, J. 1
Miranda, J. 1	Scott, Robt. Esq. 1
Milne, John 1	Scott, Rowland 1
Mosley, E. 1	Sherer, J. W. Esq. 1
Money, Wigram Esq. 1	Shearman, David 1
Money, James Esq. 1	Shobrooke, W. 1
Moir, Patrick Esq. 1	Stoane, J. B. 1
Monckton, G. Esq. (<i>Rung-</i> <i>pore</i>) 1	Smith, Cornelius 1
Mullins, C. G. 1	Stottell, Edward Esq. 1
N.	Staunton, P. H. 1
Namey, L. 1	Stewart, John 1
O.	Swaine, T. 1
Oahme, W. D. 1	T.
P.	Templeton, Thomas Esq. ... 1
Parr, Thomas 1	Templeton, Mr. Thomas... 1
Page, Thomas 1	Thomas, Robert Mosely Esq. 1
Peacock, Henry 2	Torchler, Peter Esq. 1
Perrout, John 1	Trail, Palmer and Co. 1
Pitman, T. E. 1	Trench, William 1
Purchase, T. W. 1	W.
Prince, Herbert 1	Warden, Robert Esq. 1
R.	Walters, G. H. 1
Raitt, A. 1	Williams, Wm. Grant (<i>Gen.</i> <i>Treasury</i>) 1
Radhakant, for Gopee Mo- hun Bahoo 1	Wilson, Robert 1
Reid, Price and Co. 1	Woollaston, William. 1
Ricketts, C. M. Esq. 1	Wood, John 1
Rogers, Alex. 1	Z.
	Zillah, S. 1

PREFACE.

THE utility and importance of possessing a competent knowledge of the science of Arithmetic, is too generally felt and acknowledged to require additional enforcement from a prefatory address. My design is rather to give a general idea of the method of proceeding in the ensuing treatise, and to leave the work to speak for itself, trusting to the liberality and candour of my Subscribers, and the Public, to admit, that it may facilitate the acquiring of some proficiency in the knowledge of figures, and the better by calculating with Coins, Weights, &c. with which the learner is acquainted by his local situation, rather than with those which he can form but a remote and imperfect idea of. If in this I am not unfounded it will peculiarly apply to the circumstances and situation of a large part of the community in *India*, where so many youth must have recourse to the Quill and to the Compting House, to earn their subsistence.

This Compendium contains every Rule usually taught in Schools. The gentleman, the man of business, and the directors of Public Seminaries, it is hoped will all admit its usefulness, in-as-much as it will save the instructors of youth in particular, the trouble of composing Examples for their Scholars, when from the nature of their various avocations, they can scarcely spare time for such employment.

It is hardly possible for School Masters, considering the multiplicity of their engagements, to frame questions in all the various branches of Arithmetic, without making them nearly Synonymous. And it is only by the prejudiced that it may be objected, *To teach from a printed book*, is an argument of either ignorance or incapacity. He who apprehends the progress of his Scholars to be too rapid, may undoubtedly disapprove of this method. But, that Master's ability can rarely be brought in question, whose practice is attained through the medium of classical theory, and the acquirements of the pupils will generally be proportionate to their instructor's capacity. In this Edition no Example is solved as a specimen, nor are any of the answers inserted. Both methods having appeared to the Editor a great defect in every school-book; because in many instances, the answer will enable a learner to exhibit his sum without any solution, and in others it, (as well as the solution of the first Example) may be used instead of the Rule.

The arrangement here adopted is entirely new; a just distribution of the subject into its proper parts, and a regular climax from Rule to Rule, has been carefully sought after. As to its mode of succession, I have commenced Part 1st. with the five fundamental Rules, giving a few Examples in each variety, together with some useful applications.

The Examples in Reduction are classed under the respective Coins, Weights, and Measures, to which they appertain. I have distinguished the Rule of Three into Direct and Inverse, and have made use of a more eligible method for performing the operations than in the first edition of HOPE. The Double Rule of Three may be done either by

one statement in the Rule of five, or by two Single Rules of Three—I prefer the latter. Practice contains a sufficient number of questions, in all its cases, when properly explained as they are gone through, to perfect any learner. Next follow the different calculations of rates per cent, Exchange of *Calcutta*, with various parts of *Bengal*, *England*, *Madras*, and *Bombay*, &c. Comparison of Weights and Measures with the different Presidencies, wrought several ways and exemplified in a variety of local questions:—After various other rules of Mercantile Arithmetic, (which are diversified as much as possible) the first part closes with Imports and Exports.

Part 2d. commences with the doctrine of Vulgar and Decimal Fractions, rendered easy of comprehension by explaining their nature and use in the most familiar terms, then follow the most pleasing parts of the science, viz. Allegation, Position, the use of the Square and Cube Roots, (in which are shewn a variety of useful questions) Progression, Permutations and Combinations. These, though of less general utility will operate on the minds of youth, by exciting their curiosity, affording entertainment, and creating a desire of becoming acquainted with the sublime and abstruse operations of numbers.

Part 3d. contains a great variety of calculations of rates per cent, where the rules are laid down by Arithmetical signs and wrought in Decimals, with the occasional assistance of Involution and Evolution. A collection of questions is then inserted to exercise the learner in the whole of the foregoing rules; and lastly, are several tables of Interest, Batta and Exchange, both in money and weight, between *England*, *Bengal* and *Madras*, together with a few necessary decimal

tables, which are intended to shew the young tyro the manner of constructing them, or any similar, and at the same time to prove a number of examples in the work, or otherwise, as may be necessary.

To conclude, this new edition of HOPE'S Compendium of Practical Arithmetic, with its merits and defects, is committed to the tribunal of the public, with a confidence that it will not be found erroneous or very defective; the Editor having shrunk from no exertions in the publication of this volume which could tend to render it as correct as possible, and whatever may have escaped him, he humbly hopes his worthy subscribers will generously excuse, and kindly point out any defects with a view to its future improvement, under the admission

"That he merits praise, who but endeavours well."

WILLIAM MACLEOD.

CONTENTS.

PART I.

	PAGE.
DEFINITIONS,	1
Notation and Numeration,	3
Addition,	6
Subtraction,	9
Multiplication,	12
Division,	14
Tables of Money, Weights and Measures, &c.	16
Compound Addition,	31
Compound Subtraction,	36
Compound Multiplication,	38
Compound Division,	40
Reduction of Money, Weight, Measure, and Time,	42
The Single Rule of Three Direct,	45
The Single Rule of Three Inverse,	51
The Double Rule of Three,	53
Practice,	57
Simple Interest,	61
Factor's Allowances,	67
Brokerage,	68
Insurance,	ibid.
Annuities and Pensions in Arrears,	69
Compound Interest,	70

Exchange, or Batta in <i>Calcutta</i>,	....	....	72
———With <i>Bengal</i>,	....	....	74
———With <i>London</i>,	....	....	75
———With <i>Madras</i>,	....	....	77
———With <i>Bombay</i>,	....	....	ibid.
Comparison of Weights and Measures,	....	....	79
<i>Bengal</i> Weights,	....	....	80
Factory and Bazar Weights,	....	....	ibid.
<i>Bengal</i> and Avoirdupois Weights,	....	....	81
<i>Bengal</i> and <i>Madras</i> Weights,	....	....	82
<i>Bengal</i> and <i>Bombay</i> Weights,	....	....	ibid.
Rebate or Discount,	....	....	83
Equation of Payments,	....	....	86
Company or Single Fellowship,	....	....	88
Company with time, or Double Fellowship,	....	....	91
Barter,	....	....	92
Profit and Loss,	....	....	95
Imports and Exports.	....	....	98

P A R T II.

Vulgar Fractions,	....	....	101
Reduction,	....	....	ibid.
Addition,	....	....	108
Subtraction,	....	....	109
Multiplication,	....	....	111
Division,	....	....	ibid.
The Single Rule of Three,	....	....	112
The Double Rule of Three,	....	....	114
Decimal Fractions,	....	....	115
Notation,	....	....	ibid.
Addition,	....	....	118
Subtraction,	....	....	119
Multiplication,	....	....	ibid.

CONTENTS.

vii

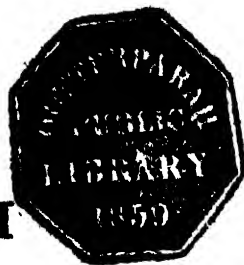
Division,	121
Reduction,	122
Compound Addition and Subtraction,	128
The Single Rule of Three,	129
Duodecimals,	130
Notation,	ibid.
Addition,	131
Subtraction,	ibid.
Cross Multiplication,	132
Division of Duodecimals,	133
Alligation Medial,	ibid.
——— Alternate,	135
——— Partial,	136
——— Total,	138
Single Position,	139
Double Position,	141
Involution and Evolution,	143
Extraction of the Square Root,	145
The Application,	147
Extraction of the Cube Root,	149
The use of the Cube Root,	151
Extracting of the Biquadrate Root,	153
——— Sursolid Root,	ibid.
——— Square Cube Root,	154
——— Second Sursolid Root,	ibid.
——— Square Biquadrate Root,	ibid.
——— Cubed Cube Root,	155
——— Square Sursolid Root,	ibid.
——— Third Sursolid Root,	156
——— Squared Square Cube Root,	ibid.
Arithmetical Progression,	157
Geometrical Progression,	162
Permutations and Combinations	167

P A R T III.

Simple Interest (by Decimals),	173
Annuities or Pensions in Arrears,	177
Present Worth of Annuities or Pensions,	180
Annuities taken in Reversion,	183
Simple Interest for Days,	185
Rebate or Discount,	186
Equation of Payments,	188
Compound Interest,	182
Annuities or Pensions, in Arrears,	191
Present worth of Annuities, Pensions, &c.	195
Annuities &c. taken in Reversion,	194
Freehold Estates, or such as continue for ever,	197
Freehold Estates in Reversion,	198
Rebate, or Discount,	199
Additional Questions for exercise,	201
Table 1. Of Interest, at 8 per cent,	213
—— 2. Of Interest at 10 per cent,	216
—— 3. Of Interest at 12 per cent,	219
—— 4. Of Roots and Powers,	221
—— 5. Of Rupees into Rupees of other Denominations,	225
—— 6. Of Sicca Rupees to Pounds Sterling,	228
—— 7. Of Current Rupees to Pounds Sterling,	231
—— 8. Of Weights from one denomination to another,	234
—— 9. Decimal parts of a Rupee,	237
—— 10. Decimal parts of a Pound Sterling,	238
—— 11. Decimal parts of a Maund,	239
—— 12. Decimal parts of an Hundred Weight,	243

A

COMPENDIUM



OF

PRACTICAL ARITHMETIC,

&c.

Definitions.

In every science there are terms used, which convey ideas peculiar to the science to which they belong—These frequently perplex the learner, not admitting, by their nature, of proper definitions in a common dictionary—The most remarkable of those used in the following treatise which could not be explained where they are used, are inserted as follow :

UNIT, a single thing—one.

NUMBER, the idea formed of an object, as one or more.

A WHOLE NUMBER, is one or more units, without any part or parts annexed—Thus, it is opposed to a fraction or fractional part, which is one or more parts of an unit, considered as broken into pieces.

A MIXED NUMBER, consists of a whole number and a fraction : as $6\frac{1}{2}$.

A SIMPLE NUMBER, is any number of things of the same denomination.

A COMPOUND NUMBER, is any number of things consisting of different denominations.

AN EVEN NUMBER, is that which may be divided into two equal parts.

B

AN ODD NUMBER, is that which cannot be divided into two parts, without having one larger than the other.

A PRIME NUMBER, is that which can only be divided by itself or by an unit.

DENOMINATION, the name of any quantity of money, weights, measures, &c. as distinguished from another quantity, either greater or less: as, pounds are a higher denomination than ounces; ounces are a lower denomination than pounds.

NAME, in this treatise, is frequently made synonymous to denomination.

INTEGER, any whole quantity or number: as an ounce, a gallon &c. or 1, 2, 3, 4, &c.

INTEGRAL PARTS, the parts of an integer: as, in speaking of pence—12 are the integral parts of a shilling—In a fraction, the denomination denotes the integral parts of the integer.

ODD QUANTITY; sometimes it signifies the remainder, sometimes the lowest parts or denominations of any sum or quantity of money, weights, &c.

ALIQUOT PART, any part of a pound, shilling, or other integer which may be contained in the integer a certain number of times, without leaving any part of itself remaining.

TOTAL, the whole of any thing when all its parts have been collected and added together.

SUM; sometimes it is used for total, sometimes it means a quantity described, and it is frequently made synonymous to question or example.

SOLUTION, the performance of any example.

CASE, the proposition to which the rule is to be adapted: thus, in Multiplication, to find the value of any number of articles under 12, is one Case; to find the value of any number of articles above 12, is another.

RULE, the direction for finding the solution to the Case.

ARITHMETICK, taken in its full extent, embraces every calculation that can be made by the assistance

of numbers, and consequently includes calculations in Mensuration, Trigonometry, and other branches of the mathematical sciences. But as these are so intimately connected with Geometry, as to render it impossible to treat of them in a manner purely arithmetical, the present work is confined to the parts principally necessary in the transactions of commerce, and to those which are preparatory to the sciences just mentioned.

PART I.

NOTATION

AND

NUMERATION.

NOTATION is the writing of numbers by figures ; and **Numeration** is the art of reading figures correctly.

CASE 1.—To express words by figures, write ciphers from the right hand to the left, till the first cipher on the left hand expresses the highest place mentioned in the given number. (*Vide p. 5.*) Then take away the cipher, and place the figure mentioned of that name in its place ; observe at what place towards the right the next significant figure is named ; take away the cipher and put the figure in its place, and thus proceed to the given number.

CASE 2.—To express figures in words, value the given number according to the table, and write down its value in words.

Examples.

The following are adapted to Case 1.—Express in figures the following numbers :

- (1)* Thirty thousand four hundred and seven.
 (2) Three hundred seventeen thousand, four hundred and sixteen.
 (3) Three million, three thousand, four hundred and fourteen.
 (4) Seven hundred million, seven hundred thousand, seven hundred and seven.
 (5) Ninety million, seven hundred and sixty.
 (6) Twelve billion, four hundred thousand million, six hundred & eighteen thousand, four hundred and ninety-six.

The following are adapted to Case 2.—Express in words the following numbers :

(7) 879	(14) 3187007613
(8) 347050	(15) 7003057079600
(9) 300070509	(16) 5700059674007
(10) 2173321904	(17) 9500790271007
(11) 1031073121	(18) 3004001007007
(12) 2000797481	(19) 3790056335790
(13) 8691234789	(20) 4700000070150

* *Note.* The figures placed between parenthesis, refer to the Key, in which the solutions will be found.

Numeration Table.

3d Period,	2d Period,	1st Period,	3d Period,	2d Period,	1st Period,
{ C Millions,.....	{ C Thousands,.....	{ Tens,.....	{ C Millions,.....	{ C Thousands,.....	{ Tens,.....
1 2 3, 4 5 6, 7 8 9	1 2 3, 4 5 6, 7 8 9	1 2 3, 4 5 6, 7 8 9	1 2 3, 4 5 6, 7 8 9	1 2 3, 4 5 6, 7 8 9	1 2 3, 4 5 6, 7 8 9
{ X Millions,.....	{ X Thousands,.....	{ Hundreds,.....	{ X Millions,.....	{ X Thousands,.....	{ Hundreds,.....
1 2 3, 4 5 6, 7 8 9	1 2 3, 4 5 6, 7 8 9	1 2 3, 4 5 6, 7 8 9	1 2 3, 4 5 6, 7 8 9	1 2 3, 4 5 6, 7 8 9	1 2 3, 4 5 6, 7 8 9
{ C Millions,.....	{ C Thousands,.....	{ Units,.....	{ C Millions,.....	{ C Thousands,.....	{ Units,.....
1 2 3, 4 5 6, 7 8 9	1 2 3, 4 5 6, 7 8 9	1 2 3, 4 5 6, 7 8 9	1 2 3, 4 5 6, 7 8 9	1 2 3, 4 5 6, 7 8 9	1 2 3, 4 5 6, 7 8 9

The following Table shows the names and divisions of the Classes.

1,	2,	3,	4,	5,	6,	7,	8,	9,	10,	11,	12,	13,	14,	15,	16,	17,	18,	19,
Units,	Tens,	Hundreds,	Thousands,	Tens of Thousands,	Hundreds of Thousands,	Thousands of Thousands,	Tens of Millions,	Hundreds of Millions,	Thousands of Millions,	Tens of Billions,	Hundreds of Billions,	Thousands of Billions,	Tens of Trillions,	Hundreds of Trillions,	Thousands of Trillions,	Tens of Quadrillions,	Hundreds of Quadrillions,	Thousands of Quadrillions,

Notation by Roman Letters.

I. One.	XXX. Thirty.
II. Two.	XL. Forty.
III. Three.	L. Fifty.
IV. Four.	LX. Sixty.
V. Five.	LXX. Seventy.
VI. Six.	LXXX. Eighty.
VII. Seven.	XC. Ninety.
VIII. Eight.	C. One Hundred.
IX. Nine.	CC. Two Hundred..
X. Ten.	CCC. Three Hundred.
XI. Eleven.	CCCC. Four Hundred.
XII. Twelve.	D. Five Hundred.
XIII. Thirteen.	DC. Six Hundred.
XIV. Fourteen.	DCC. Seven Hundred.
XV. Fifteen.	DCCC. Eight Hundred.
XVI. Sixteen.	DCCCC. Nine Hundred.
XVII. Seventeen.	M. One Thousand.
XVIII. Eighteen.	MDCCCIX. One Thou-
XIX. Nineteen.	sand eight hundred and
XX. Twenty.	nine.

ADDITION,

TEACHETH to bring several particular numbers into one total sum, called Simple Addition, when the numbers are of one signification; and compound when of different names.

Note 1. +. Saint George's cross signifies *plus*, or Addition; as $4 + 2 = 6$; i. e. 4 more 2 are equal to 6; the lines between 2 and 6, denoting *equality*.

Note 2. All Rules and Tables should be perfectly learned by heart, by the young practitioner, before he is allowed to enter into them, which is essentially necessary for the easy performance of them.

Rule.

To add any sums together, observe that the figures are placed regularly under each other, thus, units under units, tens under tens, &c. then begin at the unit's place, and add the lowest figure in that place to that above it, then add their sum to the next figure in the same place, and so on to the top: set down the overplus above ten or tens, and for every ten carry one to the next place: so proceed from place to place to the last; and set down the whole sum of the last place.

To prove Addition, reckon the figures downwards, and if the sum proves the same, you may suppose it to be right.

Ind**Table.****Index.**

0	1	2	3	4	5	6	7	8	9	0
1	2	3	4	5	6	7	8	9	10	1
2	3	4	5	6	7	8	9	10	11	2
3	4	5	6	7	8	9	10	11	12	3
4	5	6	7	8	9	10	11	12	13	4
5	6	7	8	9	10	11	12	13	14	5
6	7	8	9	10	11	12	13	14	15	6
7	8	9	10	11	12	13	14	15	16	7
8	9	10	11	12	13	14	15	16	17	8
9	10	11	12	13	14	15	16	17	18	9
10	11	12	13	14	15	16	17	18	19	10
11	12	13	14	15	16	17	18	19	20	11
12	13	14	15	16	17	18	19	20	21	12
13	14	15	16	17	18	19	20	21	22	13
14	15	16	17	18	19	20	21	22	23	14
15	16	17	18	19	20	21	22	23	24	15
0	1	2	3	4	5	6	7	8	9	0

Read thus: 1 and 1 are 2, 1 and 2 are 3, 1 and 3 are 4, &c.

A COMPENDIUM OF

(1) Mds.	(2) Seers.	(3) Chks.	(4) Days.
8 9 2	9 6 4	8 2 7	3 4 8
7 3 6	5 2 7	8 0 2	9 5 1
8 4 1	3 1 8	9 5 6	6 3 0
2 6 0	8 7 4	1 7 2	8 2 4
5 9 4	6 5 9	3 5 9	7 4 1
3 7 1	2 7 1	8 4 1	6 2 7
8 9 5	6 3 4	9 4 2	5 4 8
<hr/>	<hr/>	<hr/>	<hr/>
<hr/>	<hr/>	<hr/>	<hr/>

(5) Cubits.	(6) Tolahs.	(7) Coss.	(8) Ghurries.
9 4 5 7	5 9 4 2	6 0 4 2	5 4 0 2
6 3 0 5	6 0 0 0	7 5 0 9	9 4 6
9 1 2	7 4 5 9	3 5 1 7	3 5 1 4
4 1 8	8 0 7 6	6 9 5 4	9 0 2 8
6 0 3 7	9 5 8 3	3 2 7 4	6 0 7 3
5 1 9 2	8 2 7 4	1 1 9 2	5 4 0 2
6 0 5 9	9 6 5 0	7 6 8 4	9 9 9 9
<hr/>	<hr/>	<hr/>	<hr/>
<hr/>	<hr/>	<hr/>	<hr/>

(9) Rs.	(10) As.	(11) Pie.	(12) Cowries.
9 4 6 2 7	7 2 4 1 2	9 8 4 1 2 7	8 4 0 2 7 6 9
7 1 9 4	6 3 8 9	7 2 1 6 4 8	5 0 4 2 1 8
8 2 4 6	4 0 8 9 7	3 8 2 7 5 2	7 6 4 1 2 3
9 1 6 3 9	7 6 3 4	1 0 0 0 9 6	5 9 4 1 8 0
8 1 7 4 5	2 9 1 8 8	6 9 5 3 4	6 2 7 5 1 4
9 6 8 7	6 5 3 6	7 4 8 9 7 8	3 2 8 1 1 1
9 1 4 2 3	9 8 0 6 9	6 3 2 8 0 9	9 2 0 8 4 7
<hr/>	<hr/>	<hr/>	<hr/>
<hr/>	<hr/>	<hr/>	<hr/>

(13)	10467530	(14)	457974683217
	37604		2919792935
	63254942		47374859621
	43219		24354642
	856757		925572199991
	2041275		473214
	459		499299447325
	41210864		10049431
	52321975		41
	4686		5498936009
	43264353		943948999274
	<hr/>		<hr/>
	<hr/>		<hr/>

(15) To 424878321; add seven hundred thousand, eight hundred and forty; twice 1248732; and 7142172183.

(16) Add 4 times 17243218247 together.

(17) Add together twice four hundred thousand million, seven hundred and forty-seven; twice 74283242; and twice 44874274.

(18) Add together 2745678; twice forty thousand million four hundred sixty-seven thousand and six; 3 times 47934576879; 87496; two thousand four hundred and seven; twice fifty thousand seven hundred and nine; and 4 times 4976378947.

(19) Collect together 6 times four billion, four million, four thousand and four; 3 times 72145731; 9632; 439654; 7642; and twice four thousand nine hundred and twenty.

(20) When will a person, who was born in the year 1777, be 45 years of age?

SUBTRACTION,

TEACHETH to take a less number from a greater, to shew the difference between both.

Note. A straight line signifies *minus*, or Subtraction, as $4 - 2 = 2$, i. e. 4 less 2, are equal to 2.

Rule.

Place the less number under the greater, units under units, tens under tens, &c. as in Addition : then begin with the unit figure of the less number, and put down the difference between it and the figure above it, exactly underneath ; but if the lower figure is greater than the upper, add the difference between it, and ten to the upper number ; put down the unit figure of that sum, and add one to the next lowest number, and so proceed through the whole row, but without adding one, when in the two foregoing figures the upper number is greater than the lower.

To prove Subtraction ; add the remainder to the less number, and if the sum proves the same as the greater, it is right.

Put

Table.

Index.	0	1	2	3	4	5	6	7	8	9	10
1	0	1	2	3	4	5	6	7	8	9	
2		0	1	2	3	4	5	6	7	8	
3			0	1	2	3	4	5	6	7	
4				0	1	2	3	4	5	6	
5					0	1	2	3	4	5	
6						0	1	2	3	4	
7							0	1	2	3	
8								0	1	2	
9									0	1	

Read thus : 1 from 1, nought ; 1 from 2, one, &c.

(1) From 94607258 (2) Borrowed 78406954
 Take 4690423 Paid 36917923

Remains

Owing

Proof

Proof

(3)	94627196—	8409563
(4)	85734874—	7509374
(5)	6893476—	3476370
(6)	3487568—	1973874
(7)	8309587—	583457
(8)	7438678—	483589
(9)	45963872—	95842
(10)	64095724—	53274161
(11)	90876459—	70095876
(12)	65009007—	9784278

(13) Take 5798784312 from fifty thousand million and seventeen.

(14) Subtract seven hundred and twenty-six thousand four hundred million, from 5007894784887.

(15) Tell the difference between $23970 + 17326 + 47882 + 27390$, and two thousand four hundred million two thousand and one.

(16) Tell the difference between forty thousand million, and $87598486 + 8974105 +$ fifty billion.

(17) How much does fifty billion $+ 879 + 38657 + 15 +$ forty thousand, exceed $89748748 + 87958748 +$ thirty-five $+ 3$ times four million and seventy?

(18) What number, added to 3 times four billion six thousand million seven hundred thousand six hundred and eight, will produce the total of 3 times 34567898128856?

(19) Tell the difference between $2167 + 3$ times 82731, $+ 2$ times 96423, and four times $27963 + 4764321457$.

(20) Thomas and Hector play with two other boys, at marbles, for a week: on Monday, Thomas won 14; on Tuesday, he lost 46; on Wednesday, 27; on Friday, he won 100; and, on Saturday, 11. Hector won 17 in all: how many did Thomas win more than Hector?

MULTIPLICATION

Is a short way of performing several Additions.

Note. Saint Andrew's cross denotes Multiplication, as $4 \times 2 = 8$, i. e. 4 multiplied by 2, is equal to 8.

Rule.

Place the least number under the greatest, as before directed; then begin with the first figure of the lower number, which is called the Multiplier, and multiply it into the first figure of the upper number, which is called the Multiplicand set down the product if less than 10; but, if more than 10, or tens, set down the overplus, and add the tens to the product of the next figure in the Multiplicand, and so on till all the figures in the Multiplicand are multiplied. Proceed in the same manner with each figure in the Multiplier, setting down the first figure of each product exactly under its multiplying figure, then add all the products together.

To prove Multiplication, change the Multiplicand and Multiplier, one for the other; and, if the product proves the same, it is right.

Table.

Twice	2	are	4	5 Times	11	are	55
	3	—	6		12	—	60
	4	—	8		16	—	80
	5	—	10	6 Times	6	are	36
	6	—	12		7	—	42
	7	—	14		8	—	48
	8	—	16		9	—	54
	9	—	18		10	—	60
	10	—	20		11	—	66
	11	—	22		12	—	72
	12	—	24		16	—	96
	16	—	32	7 Times	7	are	49
3 Times	3	are	9		8	—	56
	4	—	12		9	—	63
	5	—	15		10	—	70
	6	—	18		11	—	77
	7	—	21		12	—	84
	8	—	24		16	—	112
	9	—	27	8 Times	8	are	64
	10	—	30		9	—	72
	11	—	33		10	—	80
	12	—	36		11	—	88
	16	—	48		12	—	96
4 Times	4	are	16		16	—	128
	5	—	20	9 Times	9	are	81
	6	—	24		10	—	90
	7	—	28		11	—	99
	8	—	32		12	—	108
	9	—	36		16	—	144
	10	—	40	10 Times	10	are	100
	11	—	44		11	—	110
	12	—	48		12	—	120
	16	—	64		16	—	160
5 Times	5	are	25	11 Times	11	are	121
	6	—	30		12	—	132
	7	—	35		16	—	176
	8	—	40	12 Times	12	are	144
	9	—	45		16	—	192
	10	—	50	16 Times	16	are	256

(1) Multiplicand 45396729	(2) 94763219	} Fac- tors.
Multiplier 5	17	
Product		Fact.
(3) 749136148	(4) 60479638	(5) 86438729
61	98	8765

$$(6) \quad 97304808 \times 3893$$

$$(7) \quad 30048187 \times 974500$$

$$(8) \quad 10487483 \times 109870$$

$$(9) \quad 97487300 \times 98358$$

$$(10) \quad 10089649 \times 584890$$

$$(11) \quad 97008583 \times 78398$$

$$(12) \quad 83485789 \times 934876$$

(13) If 13 marbles can be bought for 1d. how many may be bought for 1s. ?

(14) Suppose 2000 different publications are printed every year in the British Empire, and, on an average, each work contains 2 vols. and 1205 copies, or 2410 volumes are printed of each, how many volumes are printed in a year ?

DIVISION

Is a short way of performing several Subtractions, and shews how often one number is contained in another, and what remains.

Note 1. \div a line between two or four points, is the sign of Division, as $4 \div 2 = 2$, i. e. 4 divided by 2, are equal to 2.

2. The reversed parenthesis also denotes division, $2) 4$ (2).

3. Numbers thus $\frac{432}{63}$ denote Division, the lower number being the divisor, and the upper number the dividend.

SHORT DIVISION.**Rule.**

Place the divisor, or less number to the left of the dividend, or greater number; consider what number, multiplying the divisor, will produce a product equal to the first, or first and second numbers, or a product next less than them, which will be the quotient figure sought; add the overplus to the next figure, and so proceed to the end of the line.

To prove Division, multiply the quotient by the divisor, to the product add the remainder, and if it proves the same as the dividend, it is right.

(1) Dividend.
 Divisor 2) 7 2 9 8 6 0 1 2 3 (Remainder.

(2)	7 4 6 2 3 8 9 4	3
(3)	9 4 3 5 6 8 7 9	4
(4)	8 4 4 8 9 5 2 1 ÷	5
(5)	3 8 7 5 4 8 9 3	6
(6)	0 4 3 4 8 9 8 6	7 0 0
(7)	9 3 8 4 6 8 9 4	8
(8)	3 4 8 9 5 6 7 8	9 0
(9)	4 5 8 0 4 8 9 4	1 1
(10)	5 8 9 4 8 9 7 0 ÷	1 2 0
(11)	7 0 0 8 9 4 8 7 ÷	1 6
(12)	9 4 2 6 5 3 8 9	1 6 0

LONG DIVISION.**Rule.**

Place the divisor to the left of the dividend as before. Seek how often the first figure of the divisor is contained in the first, or first and second figures of the dividend, then multiply the divisor by that figure. If the product should be greater than an equal number of figures in the dividend, take one figure less for a quotient figure, and place it to the

left of the dividend. Subtract the product of the figure, and the divisor, from the first equal number of figures in the dividend, and to the remainder bring down the next figure of the dividend, proceeding as before till they are all brought down, and prove it as directed in Short Division -

(1)	Divisor.	Dividend.	Quotient.
	984	) 412681936	
(2)		89005764	97
(3)		98034352	860
(4)		18748389	539
(5)		107636216	4028
(6)		248750089	6074
(7)		87438978	92500
(8)		484873807	8473
(9)		24876344	71580
(10)		80933610	48764
✓ (11)	78048860	677164	83485789
(12)	3788076	17544	97304808

(13) If there are 5568 nuts in a bushel; how many are there in a pint?

(14) The circumference of the Earth at the Equator is 25020 miles, as it turns round once in 24 hours, how many miles do the inhabitants of those Countries near the Equator pass, in the space of an hour?

TABLES OF MONEY, WEIGHTS AND MEASURES.

Table

OF BENGAL MONEY.

2 Large, or 4 } single pice P. }	make	1 Anna, A.
16 Annas,		1 Sicca rupee, Sa. Rs.
16 Sicca rupees,		1 Gold Mohur, G. M.
100 Sicca rupees,		116 Current rupees, Crs.
an imaginary coin, in which accounts are kept in		

Bengal, of which the Europeans reckon 12 pie to the Anna, and 16 Annas to the rupee; but the natives reckon only 3 pice to the anna, each equal to 5 Gundas,

N. B. Cowries, or small shells used in the Bazars for payment of Coolies, &c. are reckoned thus :

4 Cowries,.....	make	1 Gunda.
20 Gundas, .....	.....	1 Pon.
16 Pon, .....	.....	1 Cawn.
4 Cawn, .....	.....	1 Rupee.

But these rise and fall in their value, according to the plenty or scarcity of them.

Table II.

OF ENGLISH MONEY.

4 Farthings, q.	make	1 Penny, d.
12 Pence, .....	.....	1 Shilling, s.
20 Shillings, .....	.....	1 Pound Sterling, £.
6 Pence,	$\frac{1}{2}$	a Shilling.
30d. or 2s. 6d.	$\frac{1}{2}$	a Crown.
60d. or 5s.	1	Crown.
10s. 6d.	$\frac{1}{2}$	a Guinea.
21s. or £1. 1s.	1	Guinea.

Accounts are kept in England, in Pounds, Shillings, Pence and Farthings, the latter of which are set down thus :

Farthings	{	$1 = \frac{1}{4}$	a Quarter.
		$2 = \frac{1}{2}$	A Half.
		$3 = \frac{3}{4}$	3 Quarters.

Table III.

OF BAZAR WEIGHT.

5 Siccas or quarter rupees, S. make	1 Khanchah, K.
4 Khanchah,	1 Chahtack, C
4 Chahtacks,	1 Pouah, P.
4 Pouah, or 16 Chahtacks,	1 Seer, S.
5 Seers,	1 Pussary, P.
8 Pussaries, or 40 Seers,	1 Maund, Md.

1 Bazar Md. is equal to 82½ lb. nearly.

Table IV.

OF AVOIRDUPOIS WEIGHT.

16 Drams, D.....	make.....	1 Ounce, oz.
16 Ounces,		1 Pound, lb.
28 Pounds,		1 Quarter, Qr.
4 Quarters, or 112lb. ...		1 Hundred Weight, Cwt.
20 Hundred Weight,		1 Ton, Tn.

By this weight most of the common necessities of life are weighed.

Table V.

OF GOLD AND SILVER WEIGHTS.

4 Punkho or quarter grains, make	1 Dhan or Grain, D.
4 Dhan,	1 Rutty, R.
$6\frac{1}{4}$ Rutty,	1 Anna, A.
8 Rutty,	1 Massa, M.
100 Rutty, or $12\frac{1}{2}$ Massa, or 16 As.	1 Tolah, or S. R. T.
$106\frac{1}{4}$ R. or 13, 28 $\frac{1}{2}$ 25 Ms or 17 As.	1 Gold Mohur, G.M.

dwts. grains.

A Gold Mohur = 7 - $22\frac{9}{10}$ Troy.

A Sicca Rupee = 7 - $11\frac{1}{2}$ Troy.

Table VI.

OF TROY WEIGHT.

24 Grains, G.....	make.....	1 Penny Weight, dwt.
20 Penny Weights,		1 Ounce.
12 Ounces,		1 Pound, lb. Troy.
14 oz. 11 dwt. $15\frac{1}{2}$ gr. Troy,		1 Pound Avoirdupois.

By this weight, Gold, Silver, Jewels, Amber, &c. are weighed.

Table VII.

OF BENGAL DOCTOR'S WEIGHT.

4 Jorbe, J.....	make.....	1 Rutty, Ry.
5 Rutty,		1 Mhan, Mn.
2 Mhan,		1 Massa, Ma.
2 Massa,		1 Tolah, = 1 S. R.

Table VIII.

OF APOTHECARIES' WEIGHT.

20 Grains, G.....	make.....	1 Scruple, ʒ
3 Scruples,.....		1 Dram, ʒ
8 Drams,.....		1 Ounce, ʒ
12 Ounces,.....		1 Pound, lb.

Apothecaries compound their Medicines by this weight; but Drugs are bought and sold by Avoirdupois.

Table IX.

OF GRAIN MEASURE.

5 Chahtacks, C....	make...	1 Khoonkee, K.
4 Khoonkee,		1 Rak, R.
4 Rak,.....		1 Pally, Py.
20 Pally,.....		1 Soallee, Se.
16 Soallee,.....		1 Khahoon = 40 Mds.

Table X.

OF DRY MEASURE.

2 Pints, P.	make	1 Quart, Qt.
2 Quarts,.....		1 Pottle, Pot.
2 Pottles,		1 Gallon, Gal.
2 Gallons, or 8 Quarts,		1 Peck, P.
4 Pecks,		1 Bushel, Bush.
3 Bushels,		1 Sack, S.
4 Bushels,.....		1 Coomb.
2 Coombs, or 8 Bushels,		1 Quarter.
4 Quarters,.....		1 Chalder.
5 Quarters,		1 Tun, Wey or Load.
2 Tuns, (or Weys)		1 Last.
12 Sacks, or 36 Bushels,		1 Chaldron.

Used for measuring Grain, Salt, Coals, and other dry goods, 2150—21—50 cubic inches is a Winchester bushel.

Table XI.

OF BENGAL LIQUID MEASURE.

5 Sa. Rs. Weight of Liquid, make	1 Chahtack. C.
4 Chahtacks,	1 Pouah, P.

4 Pouah,	1 Seer, S.
40 Seers,	1 Maund, Md.

Table XII.

OF ENGLISH LIQUID MEASURE.

For Wines, Spirits, &c.

28 $\frac{7}{8}$ Solid Inches,...	make 1 Pint, P.
2 Pints, P.	1 Quart, Qt.
4 Quarts,	1 Gallon, Gall.
10 Gallons,.....	1 Anchor of Rum or [Brandy,
18 Gallons,.....	1 Runlet, Rt.
31 $\frac{1}{2}$ Ditto,	1 Barrel, Bl.
42 Ditto,	1 Tierce, Tce.
63 Ditto,	1 Hogshead, Hhd.
84 Ditto, or 2 Tierces, ..	1 Puncheon, Pn.
2 Hhds. or 4 Barrels, ..	1 Pipe, Pe.
2 Pipes, or 4 Hhds. or 252 gallons,	} 1 Tun, Tn.

For Beer and Ale,

2 Pints, P...make...	1 Quart. Qt.
4 Quarts,.....	1 Gallon. Gall. or 282 Solid [Inches.
8 Gallons,	1 Firkin of Ale, F. A.
9 Gallons,	1 Firkin of Beer, F. B. .
2 Firkins, or 18 galls. .	1 Kilderkin, Kn.
2 Kns. or 36 galls. ..	1 Barrel, Bl.
1 $\frac{1}{2}$ Barrel, or 54 galls. .	1 Hogshead of Beer, H. B.
2 Barrels, or 72 galls. .	A Puncheon.
3 Barrels, or 108 Galls. .	A Butt, B.
32 Gallons, ---	1 Barrel, }
51 Gallons, ---	1 Hogshead, }
	In common.
	32 Gallons, --- 1 Barrel, }
	48 Gallons, --- 1 Hhd. }
	36 Gallons, --- 1 Barrel, }
	54 Gallons, --- 1 Hhd. }
In London. }	of Beer.

Table XIII.

OF BENGAL LONG MEASURE.

3 Grains in length, G. make	1 Finger's breadth. Fs.
24 Fingers breadth,	1 Hand, Hd. [Bh.
$\frac{1}{2}$ a Hand,	1 Span, Sn.
2 Spans,	1 Arm or Cubit, Am.
4 Arms,	1 Fathom, Fm.
1000 Fathoms, or 4000 Cubits.	1 Coss or Bengal Mile,
equal to 1 English Mile, 1 Furlong, 3 Poles,	and $3\frac{1}{2}$ Yards.
2 Coss, C. make....	1 Ghgorbutty, Ghy.
2 Goorbutty,	1 Jozun, Jn.
100 Jozun,	1 Mundulh, Ml.
100 Mundulh,	1 Condooh, Ch.
100 Condooh,	1 Gundulh, Gh.
100 Gundulh,	1 Madonie, or Cir-
cumference of the World.	

Table XIV.

OF ENGLISH LONG MEASURE.

3 Barley Corns, B. C. make	1 Inch, In.
4 Inches, ..	1 Hand, Hd.
12 Inches, .	Foot, Ft.
3 Feet, - -	Yard, Yd.
6 Feet, ---	Fathom, Fm. [P.
$5\frac{1}{2}$ Yards,	Rod, Pole, or Perch,
4 Rods or 22 Yds. -----	A land Chain, L. C.
40 Poles, or 10 Chains, - - -	Furlong, Fg.
8 Furlongs, or 1760 Yards,	Mile, Me.
3 Miles,	League, Lge.
60 Miles, or 20 Leagues, ---	1 Degree, Degr.

A degree is 69 miles, and 4 furlongs, very near, though commonly reckoned but 60 miles.

By this measure any thing having length only is measured.

Table XV.

OF BENGAL CLOTH MEASURE.

3 Jorbe, J. ....make..	1 Ungooly, Ue.
------------------------	----------------

3 Ungooly,	1 Gheria, Ga.
8 Gheria,	1 Haat or Cubit, = 18 Inches.
2 Haat,	1 Guz, equal to 1 yard.

Table XVI.

OF ENGLISH CLOTH MEASURE.

2 $\frac{1}{4}$ Inches, In.	make	1 Nail, Nl.
4 Nails,		1 Quarter, Qr.
4 Quarters,		1 Yard, Yd.
5 Quarters,		1 Ell English.
4 $\frac{1}{2}$ Quarters,		1 Ell Scots.
3 Quarters,		1 Ell Flemish.
6 Quarters,		1 Ell French.

Scots and Irish linens are bought and sold by the yard English, but Dutch linens are bought by the ell Flemish, and sold by the ell English.

Table XVII.

OF BENGAL LAND MEASURE.

According to the present rule of Measurement.

27 Jorbe, Je.	make	1 Angullae, Ae.
4 Angullae,		1 Muttihe, Mut.
3 Muttihe,		1 Begot, Bt.
2 Begot,		1 Haat or Cubit, equal [to 18 Inches.
324 Inches,		1 Square Cubit, Sq. Ct.
5 Cubits long & 4 broad, or 1 $\frac{1}{4}$ Square Cubits, }		1 Chahtack, Ck.
16 Chahtacks, or 20 Cu- bits long & 16 broad, or 4 Square Cubits, }		1 Cottah, Cot.
20 Cottahs, or 80 Cubits Square, or 6400 square cubits, }		1 Biggah, * B

* A Biggah is a square, each side subtending 120 feet, and is equal to 52 16-17 perches, ~~more~~ rather more than $\frac{1}{4}$ part of an acre; containing, in all, 14,400 square feet.

PRACTICAL ARITHMETIC.

Table XVIII.

OF ENGLISH LAND OR SQUARE MEASURE.

144 Inches, In. --	make --	1 Square Foot, Sq. Ft.
9 Square Feet,		1 Yard, yd.
272½ Feet or 30¼ yards,		1 Rod, Pole or Perch, [r. or p.
40 Poles in length & 1 in breadth,		1 Rood, Rd.
4 Roods, or 10 Chains, or	}	An Acre.
4840 roods, or 100,000		
Links,		

By this measure any thing having measurable length and breadth is measured.

Table XIX.

CUBIC OR SOLID MEASURE.

1728 Inches, --	make	A Solid foot, S. in. S. ft.
27 Feet, -----		A yard, or Cart load, yd.

By this measure any thing having measurable length, breadth and thickness, is measured.

Table XX.

OF BENGAL TIME.

18 Pollock, or winks } of the eye, P. }	make	1 Costah, Ch.
30 Costah, -----		1 Kollah, Kh.
30 Kollah, -----		1 Onoo Poll, O. Pl.
60 Onoo Pall, -----		1 Be Poll, B. Pl.
60 Be Poll, -----		1 Poll, Pl.
60 Poll, -----		1 Ghurrie=24 minutes. [Gh.
7½ Ghurries, -----		1 Phaur=3 Hours, Ph.
8 Phaur, or 60 Ghurries, -		1 Day=24 Hours, Dy.
7 Days, -----		1 Haufta, Ha.
15 Days, -----		1 Puhkee, Pee.
2 Puhkee, -----		1 Mos, Ms.
2 Mos, -----		1 Rhetoo, Rho.
1 Rhetoo, -----		1 Bhatsarrh, or year, [Bh.
12 Batsarrh, -----		1 Joog, Jg.
71 Joog, -----		1 Mundun terrah, .M.

Table XXI.

OF MOTION.

60 Seconds, ----- make ----- A Minute, ' Sec. Min.
 60 Minutes, ----- A Degree, ° Deg.
 30 Degrees, ----- A Sign, Sn.
 12 Signs, or 360 Degrees make the whole great circle
 of the Zodiac.

Motion is a Geographical Division of any line drawn round
 the circumference of the Earth.

Table XXII.

OF THINGS RECKONED BY THE TALE IN BENGAL.

4 Particulars, ----- make ----- 1 Gunda, Gnd.
 5 Gundas, ----- 1 Coorie or Corge.

Table XXIII.

OF THINGS RECKONED BY THE TALE IN ENGLAND.

12 Particulars, P. --- make --- 1 Dozen, Dn.
 20 Ditto, ----- 1 Score, Sre.
 12 Dozens, ----- 1 Gross, Gs.
 12 Gross, or 144 Dozens, -- 1 Great Gross, Gr. Gs.

Table XXIV.

SCOTS TROY WEIGHT.

16 Drops, ----- make ----- 1 Ounce,
 16 Ounces, ----- 1 Pound of 760 grains,
 16 Pounds, ----- 1 Stone.

This is generally known by the name of Dutch weight, and is
 used in weighing most Dutch and Baltic goods.

Table XXV.

SCOTS TRONE WEIGHT.

29 $\frac{3}{4}$ English Troy grains, - -- make ----- 1 Drop.
 16 Drops, or 476 E. T. grains, ----- 1 Ounce.
 20 Ounces, ----- 1 Pound.
 16 Pounds, ----- 1 Stone.

A pound of this, is equal to about 21 $\frac{1}{4}$ ounces Avoirdupois,
 or 100 pounds of this, make exactly 136 $\frac{1}{2}$ Avoirdupois.

Table XXVI.

SCOTS CORN MEASURE.

4 Lippies, -----	make -----	1 Peck.
4 Pecks, -----		1 Firlot.
4 Firlots, -----		1 Boll.
16 Bolls, -----		1 Chalder.

The Linlithgow Firlot, which is the standard for dry measure in Scotland, contains for wheat, rye, beans, pease, and salt, 21 pints 1 mutchkin; and for barley, malt, oats, and potatoes, 31 pints, measured by the sterling jug of 103,404 cubic inches.

Table XXVII.

SCOTS LIQUID MEASURE.

4 Gills, --	make --	1 Mutchkin.
2 Mutchkins, -----		1 Choppin.
2 Choppins, -----		1 Pint.
2 Pints, -----		1 Quart.
4 Quarts, -----		1 Gallon of 827- $\frac{1}{2}$ Solid Inches.

An English wine pint is reckoned nearly the same as a Scots mutchkin.

Table XXVIII.

SCOTS LAND OR SQUARE MEASURE.

1 Square Fall	is nearly	346 English Square Feet.
16 Square Falls	make ---	1 Square Gunter Chain.
2 $\frac{1}{2}$ Sq. Gunter Chains, or	}	1 Square Rood.
40 Falls,		
4 Square Roods, or	}	1 Square Acre.
6150 $\frac{1}{2}$ English Square Yards,		

The rood of mason or slater's work is 36 square Scots ells, but, through custom, it is now only reckoned 36 square English yards.

Table XXIX.

WOOL WEIGHT.

7 Pounds, ---	make ---	1 Clove, Ce.
2 Cloves, or 14 lb. ---		1 Stone, lb. Se.
2 Stones, or 28 lb. ---		1 Tod.

6 $\frac{1}{2}$ Tods,	1 Wey.
2 Weys, or 8 tods, or 240 lb.	1 Pack or Sack, Pk. or Sk.
12 Sacks, -----	1 Last.

Wool only is weighed by this weight.

** In purchasing wool of the grower, 28 lb. are a legal tod, but wool-staplers, in their dealings with each other, and with the manufacturers, sell 30 lb. to the tod, and 8 tods to the pack.

15 Pounds also make a stone.

Table XXX.

OF TIME.

60 Seconds, --- make ---	1 Minute, Sec. min.
60 Minutes, -----	1 Hour, hr.
24 Hours, -----	1 Day, dy.
7 Days, -----	1 Week, wk.
4 Weeks, -----	1 Month, mon.
365 Days 6 Hours, -----	1 Julian year, Jn. yr.
365 D, 5 h. 48 min. 57 sec.	A Solar year.

Thirty days hath September,
April, June and November;
February hath twenty-eight alone,
And all the rest have thirty-one;
Except in leap year, then's the time,
February's days are twenty and nine.

Time, is the civil division of the space taken up by the earth, in its annual progress round the sun.

Involution Table.

Square of	1	is	1	Cube of	1	is	1
-2			4	-2			8
-3			9	-3			27
-4			16	-4			64
-5			25	-5			125
-6			36	-6			216
-7			49	-7			343
-8			64	-8			512
-9			81	-9			729

This Table may be applied to Evolution, by reversing it: as, the Square root of 4 is 2; the Cube root of 8 is 2, &c.

Money Tables.

Pie.	are	As.	Ps.	Annas.	are	Rs.	As.
12	are	1	0		are	1	0
20	—	1	8		—	1	4
24	—	2	0	30	—	1	14
30	—	2	6	32	—	2	0
36	—	3	0	40	—	2	8
40	—	3	4	48	—	3	0
48	—	4	0	50	—	3	2
50	—	4	2	60	—	3	12
60	—	5	0	64	—	4	0
70	—	5	10	70	—	4	6
72	—	6	0	80	—	5	0
80	—	6	8	90	—	5	10
84	—	7	0	96	—	6	0
90	—	7	6	100	—	6	4
96	—	8	0	110	—	6	14
100	—	8	4	112	—	7	0
108	—	9	0	120	—	7	8
110	—	9	2	128	—	8	0
120	—	10	0	130	—	8	2
130	—	10	10	140	—	8	12
132	—	11	0	144	—	9	0
140	—	11	8	150	—	9	6
144	—	12	0	160		10	0
150	—	12	6	170		10	10
156	—	13	0	176		11	0
160	—	13	4	180		11	4
168	—	14	0	190		11	14
170	—	14	2	192		12	0
180	—	15	0	200		12	8
190	—	15	10	208		13	0
192	—	16	or 1 R	210		13	2

Particulars of Money.

Specie,	A GUINEA.
Alloy,	22 Carats fine, or 118,6517 gr. pure gold.
Weight Troy,	2 Carats, or 10,7865 gr. alloy.
Number to lb. Troy,	24 Parts, or 120,4382 gr. weight.
Equal in Sterling Money,	44.5.
	11. 1s.

Specie,	A GOLD MOHUR.	
Assay,	23 3 $\frac{1}{2}$	Carats fine, or 190,398 gr. pure.
Alloy,	0 0 $\frac{1}{2}$	Carats, or ,497 gr. alloy.
Weight Troy,	24	Parts, or 190,895 gr. weight.
Number to lb. Troy, ..	30,173.	
Equal in Sterling Money, ..	1l. 13s. 8d.	$\frac{1}{4}$ $\frac{1}{2}$

Specie,	A PAGODA.	
Assay,	19 gr. 0 $\frac{1}{2}$ qrs.	carats fine, or 42,048 gr. pure.
Alloy,	4 gr. 3 $\frac{1}{2}$ qrs.	carats, or 10,512 gr. alloy.
Weight Troy,	24	Parts, or 52,56 gr. weight.
Number to lb. Troy, ..	109,589.	
Equal in Sterling Money, ..	7s. 5d.	$\frac{1}{4}$ $\frac{1}{2}$

Specie,	A RUPEE.	
Assay,	11 oz 15 dwts	fine, or 175,923 gr. pure silver.
Alloy,	5 dwts.	or 3,743 gr. alloy.
Weight Troy,	12 oz.	whole parts, or 179,666 gr. weight.
Number to lb. Troy, ..	32,06	nearly.
Equal in Sterling Money, ..	2s. 0,	5659d.

Specie,	A SHILLING.	
Assay,	11 cz. 2 dwts.	fine, or 85,935 gr. pure silver
Alloy,	18 dwts.	or 6,968 gr. alloy.
Weight Troy,	12 oz.	whole parts, or 92,903 gr. weight.
Number to lb. Troy, ..	62.	
Equal in Sterling Money, ..	1s.	

Obsolete, Uncommon and Promiscuous Articles.

MONEY.

	£. s. d.	
A Guinea,	1	1
A Gold Mohur, = 16 Rupees,		
A Crown,	5	
Half a Crown,	2	6
A Portugal Piece,	1	16 commonly called
A Moidore,	1	7 [a six & thirty.
A Double Port,	3	12
A half Port,		18
A quarter ditto,	9	with its half, or
A Mark,	13	4 [4s. 6d.
An Angel,	10	
A Noble,	6	8
A Tester,	6	
A Groat,		4

PRACTICAL ARITHMETIC.

29

WEIGHTS AND MEASURES.

A Fother of Lead,	12½ Cwt.
A Truss of Hay,	56 lb.
A ditto of Straw,	36 lb. [each.
A Load,	36 Trusses of 36 lb.
A Peck Loaf,	17 lb. 6 oz. 1 dm.
A Stone of Meat,	8 lb.
A Weigh,	256 lb.
A Faggot of Steel,	6 Score, or 120 lb.
A burthen or gad of Steel,	9 Score.
A barrel of Anchovies,	30 lb.
A barrel of Figs,	from 98 to 300 lb.
A barrel of Gun-Powder,	1 Cwt.
A Pack of Wool,	240 lb.
A Puncheon of Prunes,	from 10 to 12 Cwt.
A Quintal of Fish,	100 in tale.
A Stone of Iron, Shot, or Horseman's } Weight,	14 lb.
A Stone of Hemp,	32 lb.
A Stone of Glass,	5 lb.
A Seam of Glass,	24 Stone or 120 lb
A Firkin of Butter,	56 lb.
A ditto of Soap,	64 lb.
A Tierce of Rice,	5 Cwt.
A Hogshead of Tobacco,	from 9 to 10 Cwt.
20 Stones of Flour,	1 sack.

IN CUBIC, OR SOLID MEASURE.

A Load of unhewed Timber,	40 Feet.
A ditto of hewn Timber,	50 Feet.
A Load of Tiles,	1000 in No.
A Load of Scotch Coals,	1 Cwt.
A Chaldron of Coals, in London,	36 Bushels.
A ditto of Coals, in Scotland,	12 Cwt.
A Deal of ditto, in Scotland,	23 Cwt.
A Grain of Gold, is worth about,	2d.
An Ounce of fine Silver,	from .. 5s. to 5s. 6d.
A Keg of Herrings,	60 in No.
An hundred,	is .. 120
A cade of Sprats,	1000
A cade of Herrings,	500
A Barrel,	1000
A Last,	12 barrells, or 12000.
A ditto of Corn or rape Seed,	10 Quarters.
A ditto of Gun-powder,	24 Barrells.
A ditto of Leather,	20 Dickers, each [dicker contain- ing 10 Skins.
A Dicker of Gloves,	10 Dozen pair.

A Last of Hides,	12 Do. or 20 dickers.
A ditto of Tar,	14 Barrels.
A ditto of Wool,	12 Sacks.
A ditto of Flax or Feathers,	1700 lb.
A Way, in some places,	5 Chaldron.
A way of Meal,	6 Qrs.
A Gallon of train Oil,	7½ lb.
A Tun,	252 Gallons.
A Tun of Sweet Oil,	236 Gallons.
A Load of Hay in some places, ... is ..	35, in others 30 Cwt.
In London it is nearly 18 Cwt. and sold in Trusses containing	
56, or 60 lb. a Truss, and 36 Trusses to the load.	
A Load of Bricks,	500
Bricks in general are 9 Inches long, 4½ Inches broad, and 2½	
thick.	
A Square of tiling or thatching contains 10 Feet every way;	
that is, 100 Feet.	
A Rod of Brick work, 272½ Feet, but 272 is reckoned, for	
common work.	
A stack of Wood is 3 Feet high, 3 Feet wide, and 12 Feet long,	
but this is according to the agreement of the Master and the	
Workmen.	

THINGS BOUGHT OR SOLD BY THE DOZEN, SCORE OR GROSS.

A Dozen,	is .. 12
A Score,	20
A Common Hundred,	100
A Long Hundred,	120
A Gross,	12 Dozen, or 144.
A Great Gross—12 times as many, or ..	1728
Oranges, lemons, corks, bungs, and many other things are bought	
and sold by the dozen or gross.	
Herrings and several other sorts of Fish, and all sorts of Nails,	
and many such small things have six score, or 120, to the hun-	
dred.	
An hundred of ling, or cod,	is .. 124 in No.
An hundred books, in printing,	104

PARCHMENT AND PAPER.

One Dozen,	is .. 12 Skins.
6 Dozen,	1 roll of Parchment.
A quire of Paper, for common use,	24 Sheets.
Ditto for Printers,	25 Sheets.
20 Quires,	1 Ream.
10 Reams,	1 Bale.
3 Reams,	1 Bundle.

OF BOOKS.

Elephant is the largest of all books—Folio is the next, and has but 2 leaves to the Sheet—Quarto (marked 4to.) has four leaves to a Sheet—Octavo, (or 8vo.) is a Sheet doubled into 8 parts, and Duodecimo (commonly called twelves, and marked 12mo.) has 12 leaves to the Sheet—(14mo.) has 14 leaves to the Sheet, and Pamphlets are any certain number of leaves stitched together.

A Grain being the elementary and standard weight, other weights must be compared by it;

The Ounce Troy, and Apothecaries, . . . = 480 grains.
 The Ounce Avoirdupois, only . . . = $437\frac{1}{2}$ gr.
 The Pound Troy and Apothecaries, . . . = 5760 gr.
 The Pound Avoirdupois, . . . = 7000 gr.

Hence it appears, that the Pound and Ounce, Troy and Apothecaries, are of the same weight, but the Ounce Avoirdupois is $42\frac{1}{2}$ gr. lighter than the Ounce Troy, and the Pound Avoirdupois 1240 gr. heavier than the Pound Troy.

IN WINE MEASURE.

138 Gallons of Red Port, . . . are . . 1 Pipe.
 130 Ditto of Sherry, and 126 of Malaga, . 1 Butt.
 In Cambridgeshire, and some other places
 $10\frac{1}{2}$ qrs. make . . 1 Last.
 In Long Measure, 5 Feet . . . are . . 1 Pace,
 6 Feet, or 2 Yards, 1 Fathom.
 In Square measure 100 Feet . . . are . . a Square of Flooring,
 640 Acres, 1 Mile.
 A wine gallon contains 231 Solid Inches.
 An ale gallon, 282 Ditto.
 A dry gallon, 268 $\frac{1}{2}$ Ditto.
 A hand used in measuring horses, . . is . . 4 Inches.

† All these Tables should be perfectly understood by the learner, before he proceeds any further.

COMPOUND ADDITION.

Rule.

PLACE each denomination of the different numbers to be added together, exactly under each other, and divide the sum of the first denomination to the right

by whatever number of that denomination makes one of the next, setting down the remainder, and carrying the quotient figure to the next denomination, and so proceed till the whole is finished.

Prove these sums as directed in Simple Addition.

(1)			(2)				(3)				
S. Rs.	A.	P.	G. M.	R.	A.	P.	Rs.	Cns.	Pns.	Gnds.	C.
890	14	11	340	13	12	9	901	2	13	19	3
149	10	10	571	11	14	10	450	1	11	16	1
516	13	7	195	15	10	11	516	0	10	12	0
284	15	11	8350	12	11	8	940	3	15	10	2
9870	11	0	616	7	13	6	89	0	4	7	1
3214	9	8	904	8	12	7	705	1	9	8	0
125	6	9	2075	4	10	4	68	2	1	4	1
300	8	5	118	0	14	8	210	1	12	6	0
<hr/>			<hr/>				<hr/>				
(4)				(5)				(6)			
S.	Cns.	S.	D.	Gs.	S.	Gts.	D.	Mrs.	S.	Gts.	D.
307	3	2	10 $\frac{3}{4}$	89	16	2	3	4015	15	1	2
123	1	4	9 $\frac{1}{2}$	423	10	1	0	401	10	2	0
895	0	1	11 $\frac{1}{4}$	705	19	0	2	687	12	0	3
2013	2	3	7 $\frac{1}{2}$	478	12	2	1	901	18	2	1
5490	0	2	8 $\frac{1}{4}$	7100	11	1	0	5005	19	1	0
231	1	0	6 $\frac{1}{4}$	2301	7	0	2	348	11	0	2
956	3	2	9 $\frac{3}{4}$	510	8	2	0	760	8	2	1
148	2	4	10 $\frac{1}{4}$	915	4	1	3	295	6	1	0
<hr/>				<hr/>				<hr/>			
(7)				(8)				(9)			
Mds.	Srs.	Cks.	Siccas.	Tns.	Cwt.	Qrs.	lb. oz.	Sa. Rs.	Ry.	Dn.	Pk.
4158	19	4	3	97	13	1	15 14	1075	37	2	3
820	10	7	0	154	10	0	18 12	409	18	1	2
915	12	8	1	516	17	3	20 10	812	47	3	0
367	24	10	2	708	12	2	16 11	2340	70	0	1
5210	17	12	0	2689	16	0	11 15	196	56	2	3
1705	29	15	1	941	11	3	19 13	741	68	1	0
431	35	13	3	1872	8	1	25 9	6050	29	0	2
8509	32	11	0	989	4	0	14 10	367	10	3	1
<hr/>				<hr/>				<hr/>			

PRACTICAL ARITHMETIC.

(10)				(11)					(12)				
Bs.	Oz.	Dwt.	Gr.	Ts.	Ms.	Mn.	Ry.	Ps.	Bs.	L.	S.	D.	Gr.
730	9	15	18	798	1	1	4	3	5106	10	4	1	17
56	10	12	16	176	0	1	2	0	1430	6	0	2	10
275	11	17	11	845	1	0	1	3	516	8	3	0	16
8914	8	10	20	9306	1	1	0	1	7205	9	1	2	11
401	5	18	13	518	0	1	3	0	670	1	0	1	12
874	7	11	15	602	1	0	4	2	8134	7	5	0	18
7095	9	14	19	5127	1	1	0	3	951	4	2	1	15
642	0	10	14	915	0	0	2	1	4095	0	1	2	10

(13)					(14)					(15)			
Khs.	Sc.	Py.	R.	Cks.	Lasts.	W.	Qrs.	P.	Pks.	Bush.	Pks.	Pot.	Pts.
129	13	16	2	17	908	1	3	4	2	99	2	3	1
234	10	11	0	12	145	0	2	1	3	179	0	1	2
345	14	10	1	16	810	1	0	3	1	348	1	0	1
456	12	17	3	10	234	0	1	0	2	861	2	2	0
9708	15	12	0	18	119	1	4	1	0	689	0	1	3
890	11	14	1	9	798	0	2	0	1	1210	1	0	2
689	7	10	2	15	6542	1	0	3	3	917	3	2	0
910	4	8	0	13	654	1	3	0	1	6509	0	1	3

(16)					(17)				(18)			
Mds.	Scs.	P.	Cks.	Sa. wt.	Tns.	Hhd.	Galls.	Qts.	Pipes.	Bls.	Gals.	Pts.
201	28	3	3	4	987	2	19	1	290	2	29	4
354	16	2	1	3	350	0	10	2	354	1	15	3
456	22	1	2	1	549	1	16	0	4710	0	12	0
567	9	2	1	2	760	2	12	3	457	2	16	2
678	14	0	2	3	801	0	27	0	567	0	18	1
789	15	2	1	2	6543	1	34	2	678	3	10	5
891	4	1	0	1	624	0	40	1	3487	1	17	0
1907	13	2	2	3	479	3	11	0	891	0	9	2

(18)	(19)	(21)
Pas. Tos. Gals. Qts.	Butts. Dis. Kns. Gals. Qts.	Pa. Yds. Ft. In. B.C.
3705 1 18 2	986 1 1 10 3	98 4 2 10 1
421 0 27 1	147 0 0 12 0	54 0 1 11 0
123 1 35 3	210 2 1 16 2	419 1 0 9 2
234 0 10 0	123 0 1 15 1	670 2 2 4 1
345 1 24 1	234 1 0 17 0	780 0 1 3 0
8450 0 19 0	345 0 1 11 3	894 1 2 8 2
567 0 40 2	3459 2 0 9 0	9102 0 0 1 0
765 1 26 3	980 1 1 0 2	870 1 2 0 1

(22)	(23)	(24)
Gur. Ht. Ga. Ae. Ic.	EE. Qrs. Nls. In.	Ac. Rd. Pe. Yd. Feet.
456 1 4 1 2	200 1 3 1	467 2 26 15 3
172 0 2 0 1	123 0 1 0	102 0 10 17 6
830 1 0 2 0	345 2 0 2	234 1 37 19 0
159 0 1 0 2	456 0 2 0	345 0 19 24 7
974 1 0 1 0	567 3 0 1	456 3 11 12 4
807 0 3 0 1	678 0 1 0	567 0 25 18 0
211 1 5 1 0	789 1 3 1	145 2 4 27 1
4913 0 6 0 2	890 0 2 0	987 0 9 11 0

(25)	(26)	(27)
Yds. Ft. In.	Bh. Rho. Ms. Pu Days.	S. ° ' "
1654 24 672	5684 4 1 1 13	2 24 46 16
384 22 984	248 2 0 0 12	1 20 45 15
225 18 540	16 3 1 1 11	0 15 34 45
499 14 255	8 2 0 1 8	1 18 50 25
988 9 480	469 4 1 0 4	0 21 30 30
321 8 340	4556 3 0 1 10	0 12 45 50
28 15 160	22 1 1 1 8	3 24 40 12
4562 6 890	8 2 0 0 4	1 29 59 59

(28)			(29)				(30)				
Corge.	Gnd.	Part.	Gr.	Gs.	Dn.	Part.	Leats.	Sk.	Wy.	Td.	Sa.
382	4	3	2100	11	9	10	458	10	1	5	1
25	2	1	345	7	10	9	28	9	0	4	0
12	3	2	456	9	8	6	14	8	1	3	1
528	2	0	567	10	11	8	666	7	0	2	0
69	1	2	678	4	9	0	798	6	1	1	1
34	0	3	789	0	6	4	54	2	0	4	0
421	4	1	891	5	0	1	8	1	1	3	1
28	2	2	984	6	1	7	32	7	1	2	1

(31)	Jn.	Yr.	Mo.	Wks.	Dys.	Hrs.	Me.	Sec.
	874	7	3	4	16	40	59	
	123	8	2	5	14	17	28	
	345	0	1	0	10	19	14	
	456	9	0	6	9	45	57	
	567	10	2	0	13	16	34	
	678	11	3	2	10	30	49	
	789	6	1	1	9	17	12	
	8200	5	2	0	4	9	8	

(32) A person was 24 y. 3 mo. 4 d. old, when his eldest son was born. Between the eldest and second were 2 y. 2 mo. 4 d. Between the second and third 3 y. 2 mo. 14 d. and between the third and youngest were 4 y. 1 mo. 15 d; how old will the father be, when the youngest son is 21 years of age?

(33) The great poet Milton was born 287 years after Chaucer: Dryden was born when Milton was 22 y. 8 mo. 18 d. old: Addison was born 40 y. 9 mo. 11 d. after Dryden. When Pope was born, Addison was 16 y. 21 d. old, and Thomson was born 12 y. 2 mo. 24 d. after Pope; how many years elapsed between the births of Chaucer and Thomson?

(34) An old gentleman has preserved a moidore, a mark, an angel, a noble, a crown, a tester, and a groat; what are they worth in sterling money?

COMPOUND SUBTRACTION.

Rule.

Place each denomination under its own kind. Subtract the lowest denomination to the right from its upper number, if greater than it; but from as many of that denomination as make one of the next superior, if less; and to the remainder add the upper number, carrying one to the next denomination, and thus proceed from one to the other; but omit to add 1 to them, when the upper number of the preceding is greater than the lower.

Prove these sums as directed in Simple Subtraction.

	Sr. Ps.	Fm.	Cash.			Sr. Ps.	Fm.	Cash.
(1) From	2685	30	27	take		790	32	30
	G. M.	R.	A. P.			G. M.	R.	A. P.
(2)	47150	10	9	8	—	41443	10	10
	Rs.	Cns.	Pn.	Gds. C.		Rs.	Cns.	Pn. Gds. C.
(3)	74365	1	9	11	1	7416	2	10
	£.	Cns.	S.	D.		£.	Cns.	S. D.
(4)	8730	2	1	6	—	4814	2	2
	Gs.	S.	Gts.	D.		Gs.	S.	Gts. D.
(5)	6144	12	1	2	—	425	14	1
	Moidores.	S.	Gts.	D.		Moidores.	S.	Gts. D.
(6)	3502	17	2	1	—	3140	18	1
	Mds.	Srs.	Cks.	Siccas.		Mds.	Srs.	Cks. Siccas.
(7)	4158	19	4	3	—	3809	32	11
	Tns.	Cwt.	Qrs.	lb. oz.		Tns.	Cwt.	Qrs. lb. oz.
(8)	6543	12	1	11	6	2407	15	2
	Sa. Rs.	Ma.	Ry.	Dn.	Punk.	Sa. Rs.	Ma.	Ry. Dn. Punk.
(9)	5018	4	3	1	2	3148	6	3
	lbs.	oz.	dwt.	grs.		lbs.	oz.	dwt. grs.
(10)	9783	7	6	15	—	5814	9	8
	Th.	Mn.	Ry.	Je.		Th.	Mn.	Ry. Je.
(11)	7458	1	1	2	—	4603	2	2
	lbs.	£.	3.	9. grs.		lbs.	£.	3. 9. grs.
(12)	3914	7	3	1	8	1425	9	4
	Khs.	Se.	Py.	R. Cks.		Khs.	Se.	Py. R. Cks.
13)	1987	8	10	1	15	757	12	11

(14) .. .	Lasts. Qrs. Bl. Pk.	2874 3 4 3	—	884 6 5 1
(15) .. .	Bush. Pk. Pot. Pts.	4321 2 1 3	—	2103 1 2 0
(16) .. .	Mds. Srs. P. Cks. Sa. wt.	3201 28 2 3 4	—	1907 29 3 2 3
(17) .. .	Tns. hhds. gals. qt.	7601 2 25 1	—	834 2 40 2
(18) .. .	Pns. Te. gals. pts.	4198 1 21 7	—	473 1 24 3
(19) .. .	H.B. Kns. gals. qts.	2453 1 5 1	—	615 1 6 2
(20) .. .	Pe. Yds. Ft. In. B.C.	6348 5 2 5 1	—	459 2 1 7 2
(21) .. .	Guz. Ht. Ga. Ae. Je.	8710 1 3 2 1	—	3407 0 4 0 2
(22) .. .	E.E. Qrs. Nl. In.	24150 2 2 1	—	6025 3 0 2
(23) .. .	Ac. Rd. Pe. yds. Ft.	8019 2 29 45 3	—	7621 2 31 17 6
(24) .. .	Yds. Ft. In.	1654 18 672	—	0999 22 890
(25) .. .	Bh. Rho. Ms. Pu. Dys.	5684 4 0 0 10	—	4989 5 0 1 13
(26) .. .	S.	12 18 46 16	—	1 23 48 48
(27) .. .	Corge. Gnd. Part.	382 3 2	—	287 4 3
(28) .. .	Gr.Gs. Gs. Dn. Part.	1484 10 5 8	—	687 10 7 9
(29) .. .	Lasts. Sk. Wy. Td. Se.	6458 8 0 3 0	—	4898 9 1 5 1
(30) .. .	Wks. Dys. hrs. Me. Se.	9865 3 13 40 59	—	2910 4 17 51 37

(31) How much do a sixpence, a half crown, a seven-shilling-piece, and a half guinea, exceed in value a £1. note?

(32) An Apothecary bought 10 $\frac{1}{2}$ lb. of wolfsbane, 8 $\frac{1}{2}$ lb. of fox-glove, and 3 $\frac{1}{2}$ lb. of hemlock. When he had compounded 1 $\frac{1}{2}$ lb. 7 $\frac{3}{4}$ 2 $\frac{3}{4}$ 2gr. what had he left?

(33) Bought a piece of muslin containing 20yds. Sold two young ladies 7yd. 2qr. 1na. each, for a dress; what quantity have I left?

(34) A young gentleman married when he was 23y. 7m. 3w. 6d. old. At the time of his marriage, his father was 57y. 9m. 2w. 1d. old; how old was the father when he was born?

COMPOUND MULTIPLICATION.

Rule.

Place the multiplier underneath the lowest denomination of the multiplicand. Multiply each denomination of the multiplicand by the multiplier, and manage the products as directed in Compound Addition.

The best way to prove sums in this rule, is, (when the learner is acquainted with Compound Division) to divide the product by the multiplier. If the quotient is the same as the multiplicand, it is right.

	Star	Pag.	Fm.	Cash.	
† (1) Multiply	7210	27	32	by 5	
	G. M.	Rs.	As.	P.	
† (2)	2014	13	9	9 × 6	
	Rs.	Cns.	Pn.	Gds.	C.
(3)	8714	2	12	18 3 × 8	
	£.	Cns.	s.	d.	
(4)	5021	3	4	9½ × 9	
	Gs.	S.	Gts.	D.	
(5)	4016	16	2	3 × 10	
	Moidores.	S.	Gts.	D.	
(6)	2410	20	2	3¼ × 12	
	Mds.	Srs.	Cks.	Siccas.	
† (7)	6014	36	9	3 × 16	
	Tons.	Cwt.	Qrs.	lb.	oz.
† (8)	7019	16	3	18 12 × 20	
	Sa. Rs.	Ma.	Ry.	Da.	Punk.
- (9)	3019	4	7	2 3 × 32	
	Rs.	Oz.	Dwt.	Grs.	
(10)	1970	10	17	16 × 95	
	Th.	Mn.	Ry.	Je.	
(11)	5640	3	4	2 × 198	
	Rs.	z.	3.	3.	Grs.
(12)	2410	9	6	2 16 × 207	
	Kha.	Se.	Py.	R.	Ck.
(13)	2014	15	17	3 19 × 389	



Λ (14)	Lasts.	Qrs.	Bl.	Pks.	
	7604	5	6	2	× 530
† (15)	Bush.	Pk.	Por.	Pl.	
	5108	3	2	1	× 532
† (16)	Mds.	Srs.	Cks.	Sa. wt.	
	6014	36	9	3	× 555
† (17)	Tns.	Hhds.	Gals.	qts.	
	7342	3	45	3	× 589
(18)	Pns.	Tr.	Gals.	qt.	
	4581	1	24	2	× 597
(19)	H. B.	Kn.	Gals.	qts.	
	2453	2	16	3	× 628
(20)	Pe.	Yds.	Ft.	In.	H. C.
	9254	3	1	8	2 × 633
† (21)	Guz.	Ht.	Ga.	Ac.	Je.
	5418	1	6	2	1 × 666
(22)	EP	Qrs.	Nl.	In.	
	975	3	2	1	× 677
(23)	As.	Rd.	Pe.	Yds.	Feet.
	7865	2	25	20	6 × 685
(24)	Yards.	Feet.	Inches.		
	2456	22	800		× 697
† (25)	Bh.	Rho.	Ms.	Pe.	Days.
	468	4	1	1	14 × 716
(26)	Sns.				
	3436	18	46	22	× 724
(27)	Corge.	Gnd.	Part.		
	2382	4	3		× 731
(28)	Gr. Gs.	Gs.	Dn.	Part.	
	718	7	9	10	× 777
(29)	Lasts.	Sk.	Wy.	Td.	Se.
	645	10	1	4	1 × 1712
(30)	Wks.	Dys.	Hrs.	Me.	Se.
	649	5	18	56	45 × 2941

(31) What weight of cargo, is in a barge, on board of which are 88 hogsheads of tobacco, each weighing 8cwt. 3qr. 17lb.?

(32) If I pay 18s. 9d. per week to an assistant, what is his yearly salary?

(33) What will an army of 10896 soldiers cost Government, if 1 soldier cost £.126 17s. 4d.?

(34) How much weight shall I have to pay carriage for, in having 36½ chests of onions come to me from Patna, each chest weighing 1cwt. 3lb.?

COMPOUND DIVISION.

Rule.

Place the divisor to the right of the dividend, as before directed. Divide the highest denomination by it, and multiply the remainder (if any) by as many of that denomination, as make one of the next lowest; to the product add the next denomination in the dividend, and divide as before.

To prove the work, multiply the quotient by the divisor. If the product is the same as the dividend, it is right.

(1) Divide	Sr. Ps.	Fm. Cash.	
	36059	2 0	by 5
(2)	G. M.	Rs. As. P.	
	12089	1 10 6	÷ 6
(3)	Rs.	Cus. Pns. Gds. C.	
	69717	2 7 10 0	÷ 8
(4)	Rs.	Cus. s. d.	
	45197	3 3 3 $\frac{1}{4}$	÷ 9
(5)	Gs.	S. Gts. D.	
	40168	1 0 2	÷ 10
(6)	Moidores.	S. Gts. D.	
	28929	8 2 1	÷ 12
(7)	Mds.	Srs. Cks. Siccas.	
	96238	25 9 3	÷ 16
(8)	Tons.	Cwt. qr. lb. oz.	
	140396	18 1 11 0	÷ 20
(9)	Sa. Rs.	Ma. Ry. Dn. Punk.	
	96620	8 6 0 0	÷ 32
(10)	Rs.	oz. Dwt. Grs.	
	187236	1 18 8	÷ 95
(11)	Th.	Mn. Ry. Je.	
	1116913	0 1 0	÷ 198
(12)	Rs.	₹. 5. 9. Grs.	
	499038	0 4 0 12	÷ 207
(13)	Kha.	Se. Py. R. Ck.	
	783832	8 17 0 11	÷ 389
(14)	Lasts.	Qrs. Bl. Pks.	
	4030423	0 5 0	÷ 530

(15)	Bush. 2717929	Pk. 3	Pot. 1	Pt. 0	÷ 532
(16)	Mds. 3338277	Srs. 33	Cks. 0	Sa. wt. 0	÷ 555
(17)	Tons. 4324986	Hhds. 2	Gals. 45	qts. 3	÷ 589
(18)	Pns. 2735329	Tc. 1	Gals. 10	qts. 2	÷ 597
(19)	H. B. 1541097	Kn. 1	gals. 7	qts. 0	÷ 628
(20)	Pe. 5858193	Yds. 1½	Ft. 1	Im. 2	B. C. 0 ÷ 633
(21)	Guz. 3609003	Ht. 0	Ga. 2	Ac. 0	Ja. 0 ÷ 666
(22)	E. B. 660563	Qrs. 4	Nla. 2	In. 2	÷ 677
(23)	Ac. 5387977	Rd. 1	Pe. 32	Yds. 29½	Ft. 6 ÷ 685
(24)	Yds. 1712411	Feef. 23	In. 1184	÷ 697	
(25)	Bh. 335682	Rho. 4	Ms. 0	Pe. 0	Days. 4 ÷ 716
(26)	Sps. 2488117	1	29	28	÷ 724
(27)	Corge. 1741936	Gnd. 2	Part. 4	÷ 731	
(28)	Gr. Gs. 558392	Gs. 3	Dn. 8	Part. 6	÷ 777
(29)	Lasts. 1105787	Sks. 4	Wy. 1	Td. 1½	Se. 0 ÷ 1712
(30)	Weeks. 1911141	Dys. 2	Hrs. 15	Mr. 41	Se. 45 ÷ 2941

(31) Suppose 105 pair of ladies' slippers, cost £.30 5s. 6d. what are they per pair?

(32) How much ought a person to lay up every day, who means to save £.100 per annum?

(33) Tell the price of butter per lb. when 197 ¾ lb. cost £.10 16s. 4d.

(34) If an estate of 1765 acres, were let to 57½ farmers, and ground equal to half the size of a farm were reserved for a fox covert; how much land would each farmer have?

REDUCTION,

Is the reducing, or bringing numbers of one denomination into numbers of another denomination; but of the same value.

To change great names into small, *multiply*. To change small names into great, *divide*; and whether you multiply or divide, it must be by as many of the small, as make one of the great; and by reversing the question, you will find the proof.

Students, in reducing, should consider what denominations will be the easiest for multiplying, or dividing. *Let this remark be applied in all cases both in this rule and in others.* It may be necessary, however, to observe, that in order to divide by $5\frac{1}{2}$, the sum to be divided must be multiplied by 2, and that product divided by 11; and so on for any fractional part. Also to multiply by $5\frac{1}{2}$, multiply by 5, and take the half of the multiplicand, which add to the product.

- (1) In 46 current rupees, how many pie?
- (2) In 8832 pie, how many current rupees?
- (3) In 97 C.rs. 8as. 10p. how many pie?
- (4) In 18730 pie, how many rupees?
- (5) In 13 £. how many shillings, pence and farthings?
- (6) In £.98 12s. 11 $\frac{3}{4}$ d. how many farthings?
- (7) In 12480 farthings, how many pounds?
- (8) In 94703 farthings, how many pounds?
- (9) In 720 gold-mohurs, how many annas?
- (10) Reduce 184320 annas, into gold-mohurs.
- (11) A person sent 500 gold-mohurs to the mint, to be coined into 8-rupees, 4-rupees, 2-rupees, and 1-rupee pieces, to receive an equal number of each; how many will he receive?

(12) Twenty-five coolies laboured 12 days, at 3 annas per day: what is the amount of their pay in rupees?

(13) In a sircar's escritoir, there are 914 gold-mohurs, 432 pagodas at 3 sicca rupees 12 annas each, 2000 sicca rupees, and 1600 pice, 32 to the rupee, what is the amount in rupees?

(14) A miser has hoarded up 49 guineas, 57 half guineas, 63 seven-shilling-pieces, 59 half crowns, and 20 sixpences: what sterling money ought he to receive for them?

(15) In 15 spoons, each 6 sicca rupees, 5 annas 3 pie, how many rupees weight?

BAZAR WEIGHT.

(16) In 90 maunds, how many chahtacks?

(17) In 57934 chahtacks, how many pouahs, seers, and maunds?

(18) In 57600 chahtacks, how many maunds?

(19) In 90mds. 20srs. 3po. 20chs. how many chahtacks?

(20) Divide 25 maunds of rice among the poor, at 4 seers each; how many will it suffice?

(21) In 960 maunds of rice, how many bags of rice, each lmd. 35srs.

(22) In 500 bags of rice, each lmd. 35srs. how many maunds?

AVOIRDUPOIS WEIGHT.

(23) In 7cwt. 3qrs. 10lb. how many ounces?

(24) In 3 tons of iron, how many pounds?

(25) In 6720lb. of iron, how many tons?

(26) In 14048 ounces, how many hundred weight?

(27) In 10 bars of iron, each weighing 1cwt. 3qrs. 12lb. how many pounds?

(28) In 17 pigs of lead, each weighing 4cwt. 3qrs. how many pounds?

(29) How many quarter pounds, two ounces, ounces, half ounces, and quarter ounces, may be made out of a quarter chest of tea, weighing 104 pounds, having an equal number of each?

TROY WEIGHT.

- (30) In 47 lb. 10oz. how many grains?
 (31) In 275520 grains, how many lbs. Troy?
 (32) In 17 ingots of silver, each weighing 27oz. 10dwt. how many grains?

ENGLISH LIQUID MEASURE.

- (33) In 17 gallons, how many pints?
 (34) In 7056 quarts, how many hogsheads?
 (35) In 4 tuns of oil, how many quarts?
 (36) In a pipe of wine, how many dozens, supposing each bottle to hold exactly a quart?
 (37) If 76 wine hogsheads were filled with ale, how many barrels would they contain?

ENGLISH LONG MEASURE.

- (38) In 70 miles, how many poles?
 (39) In 40 yards, how many barley-corns?
 (40) In 930400 barley-corns, how many miles?
 (41) In 4000 inches, how many yards?
 (42) In 4 leagues, how many yards?
 (43) In 15840 yards, how many leagues?
 (44) How many barley-corns in a mile?
 (45) How many barley-corns will reach round the globe of the earth, which is 360 degrees, and each degree $69\frac{1}{2}$ miles?

BENGAL CLOTH MEASURE.

- (46) In 400 cubits, how many inches?
 (47) In 7200 inches, how many guz?
 (48) In 40 bales of cloth, each 50 pieces, each 20 cubits, how many cubits?
 (49) In 120 pieces of cloth, each $34\frac{1}{2}$ cubits, how many cubits?

ENGLISH CLOTH MEASURE.

- (50) In 17 yards, 1 quarter, 2 nails, how many nails?
 (51) In 47128 nails of Irish cloth, how many pieces, each 12 yards?

(52) In 10 bales of cloth, each 12 pieces, each 25 yards, how many yards?

(53) In 7000 nails of Holland, how many ells English?

(54) Reduce 42 ells English into nails.

TIME.

(55) In 121812 seconds, how many hours?

(56) Reduce 41 weeks into minutes.

(57) In 200157 days, how many years?

(58) Reduce 413280 minutes into weeks.

(59) How many seconds in a year, allowing it to be 365 days 6 hours?

(60) How many times doth a regular clock strike in a year?

(61) From March the 9th, to November the 19th following, inclusive, how many days?

(62) How many days have passed since the birth of CHRIST, to this day, it being the 11th of August, 1809?

(63) From the 6th of June 1682, to the 5th of August, exclusive, 1721, how many days, adding 9 days for the leap years, being 1 day every 4 years?

(64) How many minutes have passed since *I was born*?

THE

SINGLE RULE OF THREE

DIRECT,

TEACHETH, from three terms or quantities known, to discover a fourth or unknown quantity, bearing a certain similitude of ratio to the terms given—Thus, if 2^{lb.} : cost 4^{d.} :: 3^{lb.} by proportion, will be found to cost 6^{d.} Again, if 2 men would be three days in doing a piece of work, by proportion we discover, that 3 men would be 2 days in doing it. Two of the

terms contain a statement, proposal, or supposition; and the other demands to know the unknown term, or occasions that demand.

Rules.

1.—STATE THE EXAMPLE.—In doing of which consider what term in the question occasions the demand, and insert that term in the third place. Consider of what kind or species the answer is to be, and put the term which is of the same in the second place; and let the term which is of the same kind or species as the third term, be in the first place.

2.—REDUCE THE TERMS IF THEY REQUIRE IT—The second to the lowest denomination mentioned in it, and the first and third to the lowest denominations mentioned in either of them.

N. B. To distinguish whether a question belongs to the Rule of Three direct, or inverse, observe, that if *the third term be greater than the first*; or the nature of the question require the answer to be *greater than the second*, the proportion is *direct*; but, if the answer ought to be *less than the second*, the proportion is *Inverse*. Or, if *the third term be less than the first*, if the nature of the question require the answer to be *less than the second*, the proportion is *direct*; but, if the answer ought to be *greater than the second*, the proportion is *Inverse*.

3.—WORK THE EXAMPLE.—When the proportion is direct, multiply the second and third terms, thus reduced, together; and divide their product by the first. When the proportion is Inverse, multiply the first and second terms, thus reduced, together, and divide their product by the third.

In either case the quotient will be the answer to the question in the same denomination as the second term was left in, when it was multiplied by the other term. This quotient, if necessary, must be reduced to some higher denomination. When, after the dividing, there is a remainder, or when the divisor is not contained in the product of the other two terms,

reduce the remainder to the next lower name, and proceed exactly as in Compound Division.

In many examples, there appear to be more than three terms, which considerably perplexes the student.—In such cases, observe carefully, that though the apparent term may make a circumstance in the question, yet it is not concerned in the proportion, and the real terms may be easily discovered by attending to the above rule and the nature of the question.

☞ By reversing the question, you will find the proof.

FINALLY.—In order to perform all examples which this extensive rule embraces, learners must expect to find many instances, wherein not only one, but several preparations are necessary; and for which no better rule can be given, than for youth to exercise their own understandings, and call in the assistance of a living teacher, when necessary.*

(1) If 24 cubits of cloth cost 18 rupees, what cost 36 cubits?

(2) A ship sailed 48 leagues in 24 hours; how many miles will she sail in a week with the same wind?

(3) If 18 seers of pepper cost 2Sa.Rs. 8as. what will 10mds. 15srs.* 8chs. cost?

(4) If I give 9 rupees for 25 skins, how much must I pay for 23 score of skins?

(5) A gentleman sold a lease of sundry houses and grounds, (which brought in 20750S.rs. 12as. in 13 years) for ten years and a half's purchase; what does the purchase money amount to?

☞ (6) A merchant paid 496S.rs. 13as. 11p. for a parcel of cloth, and when he had computed the price, found that one piece, measuring 32 cubits, stood him in 39 S.rs. 8as.—what quantity had he for his money, at that rate?

(7) Bought 75 maunds of iron, at 3as. 6p. per seer, what is the price of the whole?

(8) Four sea-cummies sailed in a ship, from the 21st of March 1807, to the 10th of January 1808, at $12\frac{1}{2}$ rs. per month, what is the amount of their wages?

(9) Suppose A. has an estate of 4500S.rs. a year, and pays 7S.rs. 8a. to the subsidy, what shall B. pay, whose estate is worth 9750Sa.rs. per annum?

(10) If the whole of a ship cost 75,000 Rupees, what is the worth of $\frac{3}{32}$ parts?

(11) What is the price of 307yds. 1cub. 6in. of silk, at 3S.rs. 4a. per yard?

(12) If 27 biggahs of land will let for 135 rupees per month, what will 135 biggahs come to in a year, at the same rate?

(13) Bought a cask of wine for 300rs. 12a. how many gallons were in the same, when the gallon was valued at 7rs. 6a.?

(14) Shipped for the Coast 1000 bags of rice, each 2mds. 5srs. what came they to, at 2rs. 5a. per md.?

(15) Suppose my length, which is just 6 feet $6\frac{1}{2}$ inches, gives 5 feet in shade, what shade will the church give, being 109 feet high?

(16) How many corge of stockings, at 20 annas per pair, may I buy for 178rs. 12as. 4p.?

(17) If 10 guz of serge cost 22 rupees, how many cubits can I purchase for 18 gold-mohurs?

(18) If 9 maunds of sugar cost 80rs. 4as. 9p. how many maunds can I purchase for 319 rupees?

(19) If coffee be sold for 35rs. per maund, what is the price of a bale weighing 19mds. 20srs. 4chs.?

(20) At 18 rupees per week, how many days board may I have for 850 rupees?

(21) If 15 maunds of wax cost 525 rupees, what cost 2 chahtacks?

(22) If I pay 1000 rupees for 2mds. 5srs. 8cks. of opium, what must I pay for 35 maunds?

(23) If the creditors of a bankrupt compound with him, to pay them 75 per cent, how much is he to pay, when the amount of their several debts, is 13543rs. 13as.?

(24) What cost 10 bales of cotton weighing 31mds. 13srs. 8chs. when a bale weighing 1md. 25srs. cost 25rs.?

(25) If a silver salver weighs 35rs. 13as. what is its worth at $1\frac{1}{2}$ annas per sicca weight?

(26) What cost 4939 case-knives, at 5rs. per dozen?

(27) A goldsmith sold a tankard for 109 rupees, at $18\frac{1}{2}$ annas per sicca weight, I demand the weight of it?

(28) If I pay 164rs. for 3mds. 4srs. of turmeric, what quantity can I purchase for 462rs. 8as. 6p.?

(29) If a family of 9 persons eat 7mds. 20srs. of rice in a month, how much will serve them, when they are 16 in a family?

(30) A merchant bought a piece of cloth for 137rs. 10as. 4p. at 13rs. 4as. per yard, how many yards did it contain?

(31) If 462rs. 8as. 6p. will purchase 8mds. 29srs. 11chs. of turmeric, how much will 164rs. purchase?

(32) If 18 horses eat up 51 maunds of gram in a week's time, how many maunds will serve 20 horses the same time?

(33) If I pay 594rs. 8as. 6p. for a pipe of Madeira, what is that per quart?

(34) If a hogshead of sweet oil cost 300 rupees, what cost a cask measuring 13 gallons 3 pints?

(35) If 3mds. 4srs. of turmeric cost 164 rupees, what will 8mds. 29srs. 11chs. cost?

(36) If 1 seer of tobacco cost 1r. 14as. 6p. what cost 3 hogsheads, each weighing 40mds. 20srs. 8chs.?

(37) If 1 oz. of silver cost 2rs. 2as. what is the price of a tankard weighing 1lb. 10oz. 10dwts. 4grs.?

(38) If 8mds. 29srs. 11chs. of turmeric cost 462rs. 8as. 6p. what will 3mds. 4srs. cost?

(39) If 1 maund of sugar cost 19 rupees, what cost 24 bags, each weighing 23mds. 15srs. 8chs.?

(40) If 1sr. 8chs. of sugar cost 14as. what cost 1md. 18srs.?

(41) If 503 pairs of shoes, according to invoice, cost 1400rs. 8as. 6p. what is the price of 1 dozen pairs?

(42) If a hamper of porter, containing 8 dozen, cost 28 rupees, what cost 113 dozen and 7 bottles?

(43) If 3mds. 4srs. of turmerick, cost 164 rupees, what will 1 seer cost?

(44) If 164 rupees will pay for 3mds. 4srs. of turmerick, how much will 1r. 5a. 1p. pay for?

(45) If 1r. 5as. 1p. will pay for 1 seer of turmerick, how much will 164 rupees pay for?

(46) If 8mds. 29srs. 11chs. of turmerick, cost 462rs. 8as. 6p. what will 1 maund cost?

(47) If 1 maund of turmerick cost 52rs. 14a. 6p. what will 8mds. 29srs. 11chs. cost?

(48) How much turmerick can I purchase for 462rs. 8a. 6p. if 1 maund cost 52rs. 14as. 5p.?

(49) How much turmerick can I purchase for 52rs. 14as. 5p. if 8mds. 29srs. 11chs. cost 462rs. 8as. 6p.?

(50) Bought a cask of turmerick for 170rs. 10a. which weighed 5mds. 20srs. 8chs. I demand the price of 4 casks, containing 6mds. 20srs. 8chs. each?

(51) Bought a quarter cask of Madeira for 150 sicca rupees, at 2rs. 11as. per gallon, how many gallons did it contain?

(52) If 27 hogsheads of brandy cost 3800rs. what is that per gallon?

(53) A draper bought of a merchant 8 packs of cloth. Each pack had 4 parcels in it, each parcel contained 10 pieces, and each piece 52 cubits; he gave after the rate of 14rs. 8as. for 14 cubits, what came the 8 packs to, and what was it worth per yard?

(54) A person being required to tell the height of a May-pole, fixed a staff near it 7ft. 9in. long; the staff cast a shadow 12ft. 1in. in length; the shadow of the May-pole was 165ft. 4in. in length: how high was it?

(55) If I can buy 12 plums for three half pence and 9 pears for the same; how many apples may I

buy for 7d. when 14 apples are worth as much as 16 plums and 12 pears together?

(56) A greyhound started a hare, at the distance of 169 of her leaps before him; the hare can make 5 leaps while the greyhound makes 3, but 3 of the greyhound's leaps are equal to 7 of the hare's: how many leaps must the dog make before he can overtake the hare?

(57) A gentleman's income is 500 guineas a year; his weekly expences are £6 10s. 6d.; his charitable donations amount to the annual sum of £56 19s.; his taxes, repairs, &c. amount yearly to £78 17s. 6d. According to this statement, how long will he be in saving 1000£?

(58) If the $\frac{1}{3}$ of 6 be 3,

What will the $\frac{1}{4}$ of 20 be?

THE .

SINGLE RULE OF THREE

INVERSE.

INVERSE Proportion, is; when More requires Less and Less requires More.—More requires Less, is when the third term is greater than the first, and requires the fourth term to be less than the second.—And, Less requires More, when the third term is less than the first, and requires the fourth term to be greater than the second.

(1) If 48 men can build a wall in 24 days, how many men can do the same in 192 days?

(2) If I lend my friend 1000 rupees for 6 months, allowing the month to be 30 days, how long ought he to lend me 10000 rupees, to requite my kindness?

(3) If 1000 rupees, in 12 months, gain 12 rupees interest, what principal will gain the same in 8 months?

(4) If an hircarrah performs a journey in 3 days,

when the days are 16 hours long, how many days will he require of 12 hours long to go the same journey in?

(5) How many yards of matting, that is half a yard wide, will cover a room that is 18 feet wide and 30 feet long?

(6) If 30 men do any piece of work in 12 days, how many men will do it in 18 days?

(7) If 15 rupees worth of wine will serve 46 men, when the pipe is worth 600 rupees, how many men will the same 15 rupees worth suffice, when the pipe is worth but 400 rupees?

(8) If when the price of a maund of flour is 6rs. 3as. the loaf should weigh 9 chaltacks what should the loaf weigh, when flour is at 4s. 6as. per maund?

(9) Suppose 800 soldiers were placed in a garrison, and their provisions were computed sufficient for 2 months; how many soldiers must depart, that the provisions may serve them 5 months?

(10) There was a certain building raised in 8 months by 120 workmen; but the same being demolished, it is required to be built in 2 months, I demand how many men must be employed about it?

(11) A piece of tapestry is 3 ells Flemish wide, and 4 ells Flemish long; and it is required to be lined with something that is but 3 quarters of a yard wide; I demand how many yards there must be, to complete the lining?

(12) How many yards of canvas, that is ell wide, will be sufficient to line 20 yards of say; that is 3 quarters wide?

(13) How many yards of green Cassimere are sufficient to make a coat of equal extent with one, which hath in it 4 yards of 7 quarters wide, when the cassimere is but 3 quarters wide?

(14) If a taylor can make a coat and waistcoat with 3 yards and three quarters of broad cloth, of one yard and a half's breadth, how many yards of stuff, of a yard and a quarter wide will he require, to fit the same person?

(15) If 12 men make 130 cubits of ditching in 4 days, in what time will 24 men perform the same, at the same rate of working?

(16) A body weighing 20 seers, is impelled by such a force as to send it 100 cubits in a second: with what velocity would a body of 8 seers weight move, if it were impelled by the same force?

(17) The battering-ram of Vespasian weighed, suppose, 100,000 lb. and was moved, let us admit, with such a velocity by strength of hands, as to pass through 20 feet in one second of time, and this was found sufficient to demolish the walls of Jerusalem; with what velocity must a bullet, that weighs but 30 lb. be moved, in order to do the same execution?

(18) How many poles in length, that is $13\frac{1}{2}$ poles in breadth must be taken to contain an acre?

THE

DOUBLE RULE OF THREE

Has five, seven, nine, &c. terms given to find another in proportion to them. The terms containing a statement, supposition, &c. are always one more in number than the terms of demand.

Rules.

1. **STATE THE EXAMPLE.**—To do so, insert the term which is of the same species as the answer in the second place, set the terms of supposition one under another in the first place, and the terms of demand one under another in the third place. In placing the terms of demand, observe to set them so that the first and third terms of every stating may be of the same species.

2. **REDUCE THE TERMS IF THEY REQUIRE IT**—the first and third in every stating to the lowest denomination mentioned in either of them, and the middle term to the lowest mentioned in it.

3. **EXAMINE WHETHER THE STATING BE DIRECT OR INVERSE**—To do this, let the middle term be considered as the second term of every stating, examine each stating according to the directions in simple proportion; when any stating is found to be direct, mark the first term with an asterisk, and when inverse, mark the third term.

4. **WORK THE EXAMPLES**—Multiply those terms together which are marked with asterisks, for a general divisor, and multiply all those which are not marked, for a general dividend. Divide the dividend by the divisor, the quotient will be the answer to the question in the same denomination as the middle term was left in, when it was multiplied with the others.

(1) If 9 men in 21 days mow 108 cottahs of ground, in how many days will five men mow 72 cottahs, at the same rate of working?

(2) If a regiment of soldiers consisting of 939 men can eat 351 maunds of rice in 7 months, how many soldiers will eat 1464 maunds in 5 months, at that rate?

(3) If an hircarrah travels 320 coss in 10 days, when the days are 12 hours long, how many days may he travel 640 coss, when the days are 16 hours long?

(4) If 360 rupees serve for the board of 12 persons 6 weeks, how long, or how many weeks, will 2600ra. serve for the board of 36 persons?

(5) If 36 seers of paddy in one year yield 216 mds. how much will 36 maunds yield in 6 years?

(6) If 50 pioneers in 6 days cast a trench 30 yards long, how many pioneers will cast a trench 200 yards long, in 3 days?

(7) If a manjee receives 30 rupees for the carriage of 30 maunds weight 150 coss, what must he receive for the carriage of 70 maunds weight 50 coss?

(8) If 6 maunds of rice are sufficient for a family

of 12 persons for 3 months, how many maunds will serve a family of 24 persons for 12 months?

(9) If 15 rupees will pay 5 men for 6 day's labour, how much will pay 20 men for 10 day's labour?

(10) If 36 cottahs of grass be mowed by 6 men in 8 days, how many cottahs may be mowed by 36 men in 38 days?

(11) If 1000 lb. of beef or pork serve 200 seamen, 7 days, how many pounds of beef will serve 550 seamen, 9 weeks?

(12) If 8000 maunds of ammunition were to be removed from a place in 9 days, and that in 6 days time I find 4500 maunds were carried away by 18 bullocks, how many bullocks would be wanted to carry away the remainder in 8 days?

(13) If 200 seers are carried 40 coss for 2rs. 4as. how much must be paid for carrying 20200 seers 60 coss?

(14) If 3 seers of cotton make 10 yards of stuff of 1 yard 2 quarters broad, how many seers would be wanted to make a piece 100 yards long, and 3 qrs. broad?

(15) If 200 seers of merchandize are carried 40 coss for 2rs. 4as. how many seers may be carried 60 coss for 340rs. 14as.?

(16) If for 2rs. 4as. 200 seers of goods are carried 40 coss, how many coss might 20200 seers be carried for 340rs. 14as.?

(17) If a seer of thread make 3 yards of linen 5 quarters broad, how many seers of thread would be wanted to make one piece of linen 45 yards long, and 1 broad?

(18) If there must be 5400 bricks, 6 inches long and 3 broad to pave a hall, how many bricks will it require to pave the same hall, that are 9in. long, and 4 broad?

(19) If an army, consisting of 7500 soldiers, eat 2865 bags of rice in 56 days, how many bags will an army, consisting of 130,000 soldiers, eat in 142 days?

(20) If the carriage of 5 maunds 30 seers weight

for 150 coss, cost 8rs. 7as. 4p. what must be paid for the carriage of 7 maunds 20 sers weight for 64 coss, at the same rate?

(21) If a piece of ground 42 cubits long and 3 broad cost 68 rupees, how much will a piece of land contiguous to it be valued at, that is 36 cubits long and 4 broad?

(22) If 8 men in 6 days dig 24 cubick cubits of earth, how many cubits, at the same rate, will 12 men dig in 3 days?

(23) If 56 loaves of bread will be sufficient for 7 men 14 days, how much bread will serve 21 men 8 days?

(24) If 8 reapers have 10rs. 8as. for 4 days work, how much will 48 reapers have for 16 days work?

(25) If 50 maunds of gram be enough for 20 horses 20 days, how many maunds will serve 60 horses 36 days?

(26) If 100 rupees in 12 months gain 12 rupees interest, what interest will 2000 rupees gain in 18 months?

(27) A certificate of the Honourable Company for 2217rs. 14as. 9p. dated 10th April, 1808, will be paid this day, being the 21st of August, 1809, what will be the amount when the said bond bears interest at 8 per cent?

(28) One person lent another 1875 rupees, for which he was to receive a certain premium by the year for every 100 rupees, and when 8 months were expired, he received his own money, and 150 rupees more; I demand, how much he received for every 100 rupees?

(29) Suppose 6 men can earn 15 guineas in 2 weeks, how long must seven men work for 25 guineas?

(30) If a compositor's wages for setting the letters in one page of the long-primer in a work, would amount to 1s 1½d. at the rate of 6¾d. per thousand, allowing 46 letters in a line, and 43 lines in a page, how much would a page of the Brevier amount to at 7½d. per thousand, allowing 57 letters in a line, and 54 lines in a page?

PRACTICE.

Tables.

Aliquot parts of an Anna and Rupee.

Pie.

$\left. \begin{array}{r} 6 \\ 4 \\ 3 \\ 2 \\ 1 \end{array} \right\}$ is the $\left\{ \begin{array}{l} \frac{1}{2} \\ \frac{1}{3} \\ \frac{1}{4} \\ \frac{1}{5} \\ \frac{1}{6} \end{array} \right\}$ of an Anna.

A. P.

$\left. \begin{array}{r} 80 \\ 54 \\ 40 \\ 28 \\ 20 \\ 14 \\ 10 \end{array} \right\}$ is the $\left\{ \begin{array}{l} \frac{1}{2} \\ \frac{1}{3} \\ \frac{1}{4} \\ \frac{1}{5} \\ \frac{1}{6} \\ \frac{1}{8} \\ \frac{1}{10} \end{array} \right\}$ of a Rupee.

Of a Pound.

S. D.

$\left. \begin{array}{r} 100 \\ 68 \\ 50 \\ 40 \\ 34 \\ 26 \\ 20 \\ 18 \\ 14 \\ 10 \end{array} \right\}$ is the $\left\{ \begin{array}{l} \frac{1}{2} \\ \frac{1}{3} \\ \frac{1}{4} \\ \frac{1}{5} \\ \frac{1}{6} \\ \frac{1}{8} \\ \frac{1}{10} \\ \frac{1}{12} \\ \frac{1}{15} \\ \frac{1}{20} \end{array} \right\}$

Of a Ton.

Cwt.

$\left. \begin{array}{r} 10 \\ 5 \\ 4 \\ 2\frac{1}{2} \\ 2 \end{array} \right\}$ is the $\left\{ \begin{array}{l} \frac{1}{2} \\ \frac{1}{4} \\ \frac{1}{5} \\ \frac{1}{8} \\ \frac{1}{10} \end{array} \right\}$

Aliquot parts of a Seer and Maund.

Cks.

$\left. \begin{array}{r} 8 \\ 4 \\ 2 \\ 1 \end{array} \right\}$ is the $\left\{ \begin{array}{l} \frac{1}{2} \\ \frac{1}{4} \\ \frac{1}{8} \\ \frac{1}{16} \end{array} \right\}$ of a Seer.

Srs. Cks.

$\left. \begin{array}{r} 200 \\ 100 \\ 80 \\ 50 \\ 40 \\ 28 \\ 20 \\ 14 \\ 10 \end{array} \right\}$ is the $\left\{ \begin{array}{l} \frac{1}{2} \\ \frac{1}{3} \\ \frac{1}{4} \\ \frac{1}{5} \\ \frac{1}{6} \\ \frac{1}{8} \\ \frac{1}{10} \\ \frac{1}{12} \\ \frac{1}{15} \end{array} \right\}$ of a Maund.

Of a Shilling.

D.

$\left. \begin{array}{r} 6 \\ 4 \\ 3 \\ 2 \\ 1\frac{1}{2} \\ 1 \end{array} \right\}$ is the $\left\{ \begin{array}{l} \frac{1}{2} \\ \frac{1}{3} \\ \frac{1}{4} \\ \frac{1}{5} \\ \frac{1}{6} \\ \frac{1}{8} \end{array} \right\}$

Of a Penny.

qr.

$\left. \begin{array}{r} 2 \\ 1 \end{array} \right\}$ is the $\left\{ \begin{array}{l} \frac{1}{2} \\ \frac{1}{4} \end{array} \right\}$

Of an Hundred Weight.

qrs. lb.

$\left. \begin{array}{r} 2 \text{ or } 56 \\ 1 \text{ or } 28 \\ 0 \text{ or } 16 \\ 0 \text{ or } 14 \end{array} \right\}$ is the $\left\{ \begin{array}{l} \frac{1}{2} \\ \frac{1}{4} \\ \frac{1}{8} \\ \frac{1}{16} \end{array} \right\}$

Of a Quarter.

lb.

$\left. \begin{array}{r} 14 \\ 7 \\ 4 \\ 3\frac{1}{2} \end{array} \right\}$ is the $\left\{ \begin{array}{l} \frac{1}{2} \\ \frac{1}{4} \\ \frac{1}{8} \\ \frac{1}{16} \end{array} \right\}$

(2) The Aliquot parts of any denominations in weights and measures may be taken in like manner.

CASE 1.—When the price of an integer is less than an anna, find the aliquot parts of that price contained in the anna, which must be the divisors to the given sum, and set them thus, $\frac{6}{3} = \frac{1}{2}$ &c. the first column being the money, and the other the parts.

Note. When there are more aliquot parts than one, their quotients must be added together, and the sum, if the first aliquot parts be taken from an anna, will be annas, or if taken from a rupee, it will be rupees. It will also be better to take parts of parts than parts of the whole price, and then the above may stand thus, $\frac{6}{3} = \frac{1}{2}$.

(1) What is the value of 931 chahtacks, at 1 pie per chahtack?

	Cks.	P.			Cks.	P.	
(2)	796	at 2	each ?	(7)	8900	at 7	each ?
(3)	987	at 3	each ?	(8)	7906	at 8	each ?
(4)	735	at 4	each ?	(9)	1401	at 9	each ?
(5)	986	at 5	each ?	(10)	1911	at 10	each ?
(6)	7416	at 6	each ?	(11)	7246	at 11	each ?

CASE 2.—When the price of an integer is less than a rupee, then find the aliquot parts of that price contained in the rupee, which must be the divisors to the given sum. Or thus: if the given price be not the aliquot part of a rupee, then first take some part of it, that is an aliquot part, and for the remaining part of the price, let it be taken out of the foregoing part or parts, and then add the quotients together as before, the total will be the answer in rupees. Or multiply the given integers by the annas, and take parts with the price, which added together gives the answer in annas.

(1) What is the value of 9276 seers, at 1 anna per seer?

	Seers.	A.	P.		Seers.	A.	P.
(2)	9718	at 1	4 each ?	(5)	7804	at 3	each ?
(3)	8704	at 2	each ?	(6)	9306	at 3	7 each ?
(4)	7912	at 2	8 each ?	(7)	9264	at 4	each ?

Ques.	A.	P.	Ques.	A.	P.
(8) 6000 at 4 10 each ?			(20) 9603 at 10 9 each ?		
(9) 8091 at 5 each ?			(21) 7912 at 11 each ?		
(10) 7269 at 5 4 each ?			(22) 7946 at 11 1 each ?		
(11) 7241 at 6 each ?			(23) 6041 at 12 each ?		
(12) 7269 at 6 5 each ?			(24) 7261 at 12 3 each ?		
(13) 9204 at 7 each ?			(25) 7024 at 13 each ?		
(14) 6924 at 7 9 each ?			(26) 9248 at 13 6 each ?		
(15) 7046 at 8 each ?			(27) 9391 at 14 each ?		
(16) 9241 at 8 1 each ?			(28) 7291 at 14 9 each ?		
(17) 9241 at 9 each ?			(29) 7912 at 15 each ?		
(18) 5951 at 9 6 each ?			(30) 9816 at 15 9 each ?		
(19) 6302 at 10 each ?					

CASE 3.—When the price of an integer is greater than a rupee, but less than two rupees, then let the part or parts be taken only with so much of the given price, as is more than one rupee, that is, if the price be 1r. 6as. 2p. take the parts only with 6as. 2p. and let the given quantity stand for rupees, which must be added with the rest, and the total will be the answer in rupees. Or, reduce the given sum to annas, and multiply the quantity by the annas, and take parts with the rest, then add them together, the sum will be the answer in annas.

(1) What is the value of 7694 maunds, at 1 rupee 1 anna per maund.

Mds.	Rs.	as.	p.	Mds.	Rs.	as.	p.
(2) 7243 at 1 2 each ?				(12) 9426 at 1 9 8 each ?			
(3) 6384 at 2 3 each ?				(13) 7312 at 1 10 9 each ?			
(4) 7916 at 3 0 each ?				(14) 6019 at 1 11 0 each ?			
(5) 3333 at 3 6 each ?				(15) 9071 at 1 11 1 each ?			
(6) 9116 at 4 7 each ?				(16) 9412 at 1 12 0 each ?			
(7) 7602 at 5 0 each ?				(17) 3591 at 1 12 4 each ?			
(8) 9172 at 5 10 each ?				(18) 6290 at 13 5 each ?			
(9) 6837 at 6 11 each ?				(19) 9706 at 14 0 each ?			
(10) 9418 at 7 2 each ?				(20) 7974 at 14 8 each ?			
(11) 6914 at 7 4 each ?				(21) 240 at 15 2 each ?			
(12) 1111 at 8 5 each ?				(22) 609 at 15 6 each ?			
(13) 9416 at 9 0 each ?							

CASE 4.—When the price of an integer is rupees only, multiply the given integers by the price, the product will be the answer.

(1) What is the value of 85 cases of gin, at 1 gold-mohur per case?

(2) 946 pair of shades, at 18rs. per pair?

(3) 459 pieces of silk, at 31rs. per piece?

(4) 942 corgie of stockings, at 24rs. per corgie?

(5) 724 dozen of claret, at 25rs. per dozen?

(6) 20000 quills, at 3rs. per hundred?

CASE 5.—When the price of an integer is rupees, annas and pie, multiply the given integers by the rupees, and divide by the parts, which added together gives the answer.

(1) What is the value of 3 pieces of cloth, each 15 yards, at 7rs. 8as. per yard?

(2) What is the value of 75 cubits of muslin, at 2rs. 8as. 6p. per cubit?

Yards.	Rs.	as.	p.		Yards.	Rs.	as.	p.
(3) 731 at	6	8	0 each?	(9) 200 at	7	1	4 each?	
(4) 924 at	9	12	0 each?	(10) 594 at	20	5	4 each?	
(5) 812 at	8	1	0 each?	(11) 739 at	6	3	9 each?	
(6) 6418 at	2	5	0 each?	(12) 729 at	7	3	11 each?	
(7) 693 at	6	15	0 each?	(13) 900 at	9	15	11 each?	
(8) 641 at	31	5	4 each?	(14) 719 at	5	7	9 each?	

CASE 6.—When the number of the integers does not exceed 12, multiply the price by the integers, as in Compound Multiplication; the quotient will be the answer.

(1) What is the value of 10 maunds of wood, at 10rs. 10as. 8p. per maund?

(2) 16 maunds at 65rs. 12as. per maund?

(3) 11 maunds at 17rs. 14as. 6p. each?

(4) 8 maunds at 64rs. 10as. 8p. each?

(5) 9 Yards at 9rs. 15as. 9p. each?

(6) 12 Yards at 84rs. 18as. 7p. each?

CASE 7.—When the goods and the prices are of different denominations, multiply the integers of each denomination together, and take parts with the parts of the integers from one another, thus:

(1) What is the value of 99mds. 1sr. 4cks. of sugar, at 8rs. 8as. per maund.

- (2) 6mds. 2srs. 8cks. of fine salt, at 5rs. 4as. per maund?
- (3) 12mds. 8srs. 4cks. of wax candles, at 72rs. 8as. per maund?
- (4) 5srs. 2cks. of tootanager, at 25rs. 8as. 4p. per maund?
- (5) 20srs. 8cks. of iron, at 8rs. 6p. per maund?
- (6) 1md. 19srs. 8cks. of sugar, at 6rs. 8as. per maund?
- (7) 1md. 27srs. 4cks. of raisins, at 49rs. 8as. per maund?
- (8) 36 seers of almonds, at 85rs. 9as. per maund?
- (9) 31 seers of jaggery, at 6rs. 8as. per maund?
- (10) 17srs. 8cks. of fine coffee, at 220rs. per maund?
- (11) 3 seers of tea, at 120rs. per maund?
- (12) 9mds. 10srs. 4cks. of ghee, at 11rs. 12as. 6p. per seer?
- (13) 8mds. 12srs. 7cks. of opium, at 7rs. 14as. per seer?
- (14) 8yds. 18in. of broadcloth, at 15rs. 13as. 4p. per yard?
- (15) $12\frac{1}{2}$ pieces of muslin, at 20rs. 5as. 4p. per piece?
- (16) 16a. 2r. 18p. of land, at £.63 18s. 9d. per acre?
- (17) 21t. 1hhd. $4\frac{1}{4}$ gals. of fine Herefordshire cider, at £.36 9s. 4d. per tun?
- (18) 139yds. 3qrs. 3nls. 2in. at 9rs. 11as. 7p. per yard?
- (19) 549 pipes, 1hhd. 52galls. 3qts. at £.36 16s. 7½d.?
- (20) 767cwt. 3qrs. 20lb. 13oz. at £.78 18s. 10½d.?

SIMPLE INTEREST,

Is a premium paid by the borrower of money to the lender, and is the profit which arises from the loan

of it. In resolving questions in interest regard as follows:

- 1st. The principal, or money lent, P.
- 2dly. The rate per cent, or premium, R.
- 3dly. The time for which the principal is lent, T.
- 4thly. The amount, or sum of the principal and interest, A.

CASE 1.—When the interest of any sum of money for one year or more is required.

Rule.

As 100,

Is to the rate per cent;

So is the principal

To its interest for one year, which being multiplied by the number of years, (if more than one is required) gives the interest for that time.

(1) If 100 rupees principal in one year's time yield 12 rupees interest, what will 486rs. yield in the same time?

(2) What is the interest of 76 rupees for 2 years, at 9 per cent per annum?

(3) What is the interest of 320 rupees for a year, at 10 per cent per annum?

(4) What is the amount of 3000 rupees for 12 years, at 9 per cent per annum?

(5) What is the amount of 5000 rupees for 12 years, at 12 per cent per annum?

CASE 2.—To find the interest of any sum for $\frac{1}{2}$, $\frac{1}{4}$, or $\frac{3}{4}$ of a year, besides the number of years given in the question.

Rule.

For $\frac{1}{4}$ year take a quarter part of the interest of 1 year; for $\frac{1}{2}$ a year, take half of the interest of one year; for $\frac{3}{4}$ of a year, take the parts compounded of $\frac{1}{4}$, and add them to the interest for the rest of the time; the sum will be the interest required.

(1) What is the interest of 200 rupees for 3 years and $\frac{3}{4}$, at 9 per cent per annum?

(2) What is the interest of 468rs. 12as. 4p. for 1 year and $\frac{3}{4}$, at 8 per cent per annum?

(3) What is the interest of 112rs. 10as. 8p. for $5\frac{1}{2}$ years, at 8 per cent per annum?

(4) What is the interest of 1468rs. for $4\frac{1}{2}$ years, at 12 per cent per annum?

(5) What is the interest of 1000rs. for $2\frac{1}{2}$ years, at 12 per cent per annum?

CASE 3.—To find the interest of any sum for any number of months less than 12.

Rule.

Take parts with the number of months given out of 12, and divide the interest of one year by those parts for the interest of the months required.

(1) What is the interest of 1000 rupees for 5 months, at 8 per cent per annum?

(2) What is the interest of 5000rs. 8as. for $6\frac{1}{2}$ months, at 10 per cent per annum?

(3) What is the amount of 3260rs. 5as. 4p. for 10 months, at 6 per cent per annum?

(4) What is the interest of 4500rs. for 1 year and 4ms. at 12 per cent per annum?

(5) I demand the amount of 3276rs. 12as. for 2 years 2 months, at 8 per cent per annum?

CASE 4.—To find the interest of any sum when the rate per cent is $\frac{1}{4}$, $\frac{1}{2}$, or $\frac{3}{4}$ more than the rupees given in the said rate.

Rule.

Multiply the principal by the rupees in the rate per cent as before, and let the parts for $\frac{1}{4}$, $\frac{1}{2}$, and $\frac{3}{4}$ be taken from the principal and added to that product, then proceed as in Case the 1st, and 2d.

(1) What is the interest of 400 rupees for 2 years, at $9\frac{1}{2}$ per cent per annum?

(2) What is the interest of 1020 rupees for a year, at $10\frac{1}{2}$ per cent per annum?

(3) What is the amount of 1690 rupees for 3 years, at $10\frac{1}{4}$ per cent per annum?

(4) What is the amount of 1120rs. 10as. for $2\frac{1}{2}$ years, at $9\frac{1}{4}$ per cent per annum?

(5) What is the interest of 3400 rupees, for $5\frac{1}{4}$ years, at $8\frac{3}{4}$ per cent per annum?

CASE 5.—To find the interest of any sum for any certain number of weeks.

Rule.

As 52 weeks,

Are to the interest of the given sum for 1 year;

So are the weeks given,

To the interest required.

(1) What is the interest of 400 rupees, for 13 weeks, at 9 per cent per annum?

(2) What is the interest of 1126rs. 12as. for 16 weeks, at $11\frac{1}{2}$ per cent per annum?

(3) What is the amount of 5000 rupees, for 20 weeks, at 12 per cent per annum?

(4) What is the interest of 600rs. 10as. for 1 year and 20 weeks, at 11 per cent per annum?

(5) What is the amount of 7100rs. 4as. 9p. for 2 years and 15 weeks, at 10 per cent per annum?

CASE 6.—To find the interest of any number of days.

Rule.

Multiply the principal by the days, and by the rate of interest for a dividend; and 365 by 100 for a divisor; the quotient will be the answer: which rule is according to a Double Rule of Three stating, thus:

$100 \times 365 : \text{Rate} :: \text{Principal} \times \text{Time} : \text{Interest}.$

(1) What is the interest of 1120 rupees for 126 days, at 10 per cent per annum?

(2) What is the interest of 955rs. 10as. for 145 days, at 11 per cent per annum?

(3) What is the interest of 625 rupees from June 1st 1808, to March 9th 1809, inclusive, at 12 per cent ?

(4) What is the amount of 500 rupees from January 30th, to September 1st following, each included, at 9 per cent per annum ?

(5) How many rupees am I to pay for 945rs. 14as. 6p. lying at interest from 10th September 1807, until 16th July 1809, each included, at $9\frac{1}{2}$ per cent per annum ?

CASE 7.—To find the principal when the amount, time, and rate per cent are given.

Rule.

As the amount of 100 rupees at the rate and time given

Is to 100 rupees;

So is the amount given,

To the principal required.

Note. Case 7th, 8th and 9th, prove each other.

(1) What principal being put to interest for 9 years, at 10 per cent per annum, will amount to 1725 rupees ?

(2) What principal being put to interest for 7 years, will amount to 7930rs. 12as. at 8 per cent per annum ?

(3) What sum being put to interest, will amount to 5200rs. 15as. 8p. in 8 years, at 9 per cent per annum ?

(4) What sum being put to interest, will amount to 2000 rupees in 5 years, at 12 per cent per annum ?

(5) What sum being put to interest for 6 years will amount to 100,000 rupees, at 11 per cent per annum ?

CASE 8.—To find the rate per cent, when the amount, time, and principal are given.

Rule.

As the principal,

Is to the interest for the whole time ;

So is 100,

To its interest for the same.

Divide the interest last found by the time, and the quotient will be the rate per cent.

(1) At what rate of interest per cent, will 907rs. 14as. 3p. amount to 1725 rupees, in 9 year's time ?

(2) At what rate of interest per cent, will 5083rs. 13as. amount to 7930rs. 12as. in 7 years ?

(3) At what rate of interest per cent, will 3023rs. 13as. 8p. amount to 5200rs. 15as. 8p. in 8 years ?

(4) At what rate of interest per cent, will 12500 rupees amount to 20000 rupees, in 5 year's time ?

(5) At what rate of interest per cent will 60240rs. 15as. 5p. amount to 1 lack rupees in 6 years ?

CASE 9.—To find the time, when the principal, amount, and rate per cent are given.

Rule.

As the interest of the principal for 1 year at the given rate,

Is to one year ;

So is the whole interest,

To the time required.

(1) In what time will 907rs. 14as. 3p. amount to 1725 rupees, at 10 per cent per annum ?

(2) In what time will 5083rs. 13as. amount to 7930rs. 12as. at 8 per cent per annum ?

(3) In what time will 3023rs. 13as. 2p. amount to 5200rs. 15as. 8p. at 9 per cent per annum ?

(4) In what time will 12500 rupees amount to 20000 rupees, at 12 per cent per annum ?

(5) In what time will 60240rs. 15as. 5p. amount to 1 lack rupees, at 11 per cent per annum.

FACTOR'S ALLOWANCES.

COMMONLY CALLED

COMMISSION or PROVISION.

ARE allowances from merchants to their agents or factors beyond the seas, in the buying or selling of any sort of goods, and is a certain rate per cent, according to the custom of the country where the factor resides.

Rule.

Calculate the commission, as in case 1st of Simple Interest for 1 year.

(1) My factor sends me word that he has bought goods to the value of 1109rs. 8s. 4p. upon my account; I demand what his commission comes to, at $3\frac{1}{2}$ per cent?

(2) Negotiated, bills on account of A. Colvin, Esq. to the amount of 1400 rupees, what is my commission, at $1\frac{1}{2}$ per cent?

(3) My correspondent has disbursed on my account the sum of 1009rs. 8s. what must he demand for his commission, when I allow him $2\frac{1}{2}$ per cent?

(4) Suppose I allow my correspondent $1\frac{1}{2}$ per cent for provision, what may he demand on the disbursement of 704rs. 15s. 4p.?

(5) Suppose I disburse on account of my correspondent at Madras the sum of 8009rs. 8s. 6p. at $2\frac{1}{2}$ per cent, what will my bill amount to?

(6) My correspondent in America buys goods on my account to the value of £15679 19s. 6d. what will these goods cost me when I have paid the commission, which is £4 3s. 9d. per cent?

(7) What does a book cost me in London, for which I pay 3s. 4d. besides a commission to the buyer, of 5 per cent?

BROKAGE.

BROKAGE is an allowance to persons called brokers at a certain rate per cent for finding customers, and selling to them the goods of other men, whether natives or strangers.

Rule.

Divide the given sum by 100, and take parts from the quotient with the rate per cent; but if the brokerage should exceed 1 per cent the operation will be the same as in Case 1st of simple interest for 1 year.

(1) What is the brokerage of 700rs. 14as. 6p. at 12as. per cent?

(2) What may a broker demand for brokerage, when he sells goods to the value of 500rs. 10as. 7p. and I allow him 14as. per cent?

(2) Suppose I employ a broker, who sells goods to the value of 909rs. 14as. 10p. what is the brokerage at $1\frac{1}{2}$ per cent?

(4) I have sold goods for my correspondent to the amount of 1408rs. 12as. 6p. who allows me 8as. per cent; what is the amount of my brokerage?

(5) What is the amount of my bill in disbursing of 1250 rupees, at 10as. per cent?

(6) What will the yearly wages of a broker amount to, who during that time sells £.227965 14s. 4d. worth of goods, on an allowance of 7s. 6d. per cent?

INSURANCE.

Is paid by one merchant to another, or to a company for ensuring his ships, goods, &c. that is, engaging to make good the value insured, should the same be lost or damaged.

Rule.

Calculate the insurance, as in Case 1st of Simple Interest for 1 year.

(1) Insured 4720rs. 13as. on the ship *Sea-horse*, for the present voyage to Madras, insurance at $14\frac{1}{2}$ per cent, what does it amount to?

(2) Bought by order of Lieutenant M. Hanley of Bombay, and for his account, 400 bags of salt-petre, which cost 20,000rs. 9as. 6p. which I insured at 15 per cent, and charged commission on the amount purchase, and insurance at $2\frac{1}{2}$ per cent, I demand the insurance and commission on the same?

(3) Insured the ship *Betsey*, Captain Saumarez, on a voyage to China. She and her cargo being valued at 80,000 rupees, insurance at $16\frac{1}{2}$ per cent, what is the insurance?

(4) My correspondent advises me, that he has shipped on board the *Spit-fire* snow, 100 pieces of Madras cloth, at 56rs. per piece, which he has insured at $14\frac{1}{2}$ per cent, charged me with commission at 2 per cent, and drawn on me for the amount. What is that?

(5) What is the insurance of 100 chests of Opium, each valued at 450 rupees, sent to Rangoon in the *Charlotte*, at $12\frac{3}{4}$ per cent?

(6) What premium must be paid for the insurance of certain premises valued at £.569 14s. the insurance being at 10s. per cent?

(7) What is the insurance of property valued at £.12742, the premium being at $\frac{1}{2}$ per cent?

ANNUITIES & PENSIONS

IN ARREARS.

AN Annuity, or Pension, is supposed payable upon the day it becomes due; but if it be forborn, i. e. unpaid beyond that day, it is then in arrear.

Rule.

Find the interest of the given annuity for 1 year, and then for 2, 3, &c. years, up to the given time, as 1: multiply the annuity by the number of years given, then add the several interests and the product into one sum.

(1) If an annuity of 4000 rupees be forborn 5 years, what will be due for principal and interest at the end of the said term, simple interest being computed at 9 per cent per annum?

(2) A house being let upon a lease of 12 months at 500 rupees per month, and the rent being in arrear for the whole term, I demand the sum due at the end of the term, simple interest being allowed at 12 per cent?

(3) If the payment of a pension be omitted 7 years, what will it amount to in that time, supposing it to be 1500 rupees, at 6 per cent?

(4) Suppose a salary of 1000 rupees per month be forborn 7 months, what is the amount at 8 per cent per annum?

(5) If 1800 rupees annuity, payable every half year, were unpaid 5 years, what will it amount to in that time at 7 per cent?

(6) What will an annuity of £.250 amount to in 7 years to be paid by quarterly payments, at 6 per cent per annum?

COMPOUND INTEREST

OR

INTEREST UPON INTEREST,

Is that which arises from any principal and its interest put together, and though it is not lawful to let out money in that manner, yet in purchasing of annuities, or pensions, and leases in reversion, it is com-

monly allowed to the purchaser for his ready money.

Rule.

To find the compound interest of any given sum for any number of years, find the amount of the given sum by simple interest for the first year, which is the principal for the second year, then find the amount of that principal for the second year, and that is the principal for the third year, and so on for any number of given years, then subtract the sum from the last amount, and the remainder is the compound interest required.

(1) What will be the amount and compound interest of 1000 rupees in three years' time, at 12 per cent per annum?

(2) What is the compound interest of 1200 rupees for three years, at 12 per cent per annum?

(3) What sum will 1500 rupees amount to in 4 year's time at $11\frac{1}{2}$ per cent per annum, compound interest?

(4) What is the compound interest of 500rs. 12as. for $5\frac{1}{2}$ years, at 10 per cent per annum?

(5) What sum will 940rs. 12as. 11p. amount to in 7 year's time, at $11\frac{1}{4}$ per cent per annum, compound interest?

(6) What sum will 1500rs. amount to in 4 year's time, at $11\frac{1}{2}$ per cent per annum, compound interest?

(7) What is the compound interest of £. 57 16s. 6d. for 5 years, 7 months, and 15 days, at 5 per cent per annum?

(8) A person died worth £. 3579 16s. 4d. when his only son was 16 years old. His fortune consists of estates and money out at interest, and on an average produces $4\frac{1}{2}$ per cent. The interest payable half yearly. As his guardians know how to dispose of the interest as it arises, in such a manner as to make it pay the same as the principal, what will the young gentleman's fortune amount to when he becomes of age?

EXCHANGE,

Is the giving of money, weight, or measure of one country, for the like value in bills, money, weight, or measure of another country.

B A T T A,

Is the reducing or changing rupees of all denominations in coin, to currency, an imaginary coin so called, of which 12 current pie are 1 current anna, 16 current annas 1 current rupee, and the difference in the value between rupees in specie and current rupees, is called Batta.

To this currency must all the real specie be turned or reduced, before any sum or sums can be regularly entered into a merchant's book or books of accounts.

Rule.

To reduce sicca rupees to current rupees, multiply the sum given by 116, (when they are 16 per cent better than current rupees,) and divide that sum by 100, the quotient will be the sum required in current rupees.

To reduce current rupees to sicca specie, multiply the sum given by 100, and divide that product by 116, the quotient will be the sum required in sicca specie.

In like manner may all rupees be reduced to currency, or currency to those, regarding how much they are better than current.

Note.

	116	Ct. Rs.	Se. Rs. As. P.
100 Sicca Rupees, are	116		
100 Madras Arcot,	108		93 1 7
100 Bombay Soortie,	110		94 13 9
100 Mooney Soortie,	109		94 6 0
100 Sonaut Fooly,	113		97 9 1
100 Old Sonaut,	111		95 11 1

100 Patna Sonant,.....	111	95 11 3
100 Firkhabad,.....	112 8	87 8 0
100 Moorshedabad, ...	111	94 13 6
100 Mochedah,.....	109	94 0 0
100 Lucknow,.....	113 8	97 13 0
100 Duss Massa,.....	110	94 13 9
100 Current Rupees,...		86 3 4

But as the prices of the above rupees are continually fluctuating, they are not to be depended upon.

(1) In 9470 sicca rupees, how many current rupees?

(2) In 10985c.rs. 3as. 2p. how many sicca rupees?

(3) Reduce 1147sa.rs. 14as. 4p. into current rupees?

✓ (4) Reduce 1331c.rs. 8as. 10p. into sicca rupees?

(5) In 739 Arcot rupees, at 8 per cent better than current rupees, how many current rupees?

✓ (6) In 798c.rs. 1a. 1p. how many Arcot rupees?

✓ (7) In 635 Bombay Soortie rupees, how many current rupees?

✓ (8) In 864rs. 12as. 9p. of Bombay, how many current rupees?

✓ (9) In 686c.rs. 7as. 7p. how many mooney soortie rupees?

✓ (10) In 637rs. 10as. at $5\frac{1}{2}$ per cent better than current rupees, how many current rupees?

(11) In 76rs. 4as. 6p. at 3rs. 2as. per cent better than current rupees, how many current rupees are there?

(12) In 755 Mochedah rupees, how many current rupees?

(13) In 375rs. 8as. 6p. at 7 $\frac{1}{2}$ per cent better than current rupees, how many current rupees?

✗ (14) In 672c.rs. 11a. 1p. how many rupees, at $5\frac{1}{2}$ per cent better than current rupees?

(15) In 83c.rs. 14as. 6p. how many rupees are there, at $4\frac{1}{2}$ per cent better than current rupees?

(16) In 802c.rs. 3as. how many Mochedah rupees?

(17) In 404c.rs. 13a. 2p. how many rupees, at $7\frac{1}{2}$ per cent better than current rupees?

(18) My debtor desires me to send my sircar for the balance of account, viz 1764c.rs. 8a. 11p. how many sicca rupees must he receive?

(19) Received on account of A. B. 1557 Lucknow rupees; how many rupees current may I give him credit for, at 13rs. 8as. per cent better than current rupees?

(20) What is the value in Lucknow rupees, at 13rs. 8as. per cent better than current, of 1050 current rupees?

(21) Drew upon A. B. of Firkhabad for 5000rs. 8a. 10p. what number of rupees of that place must he answer for at 12rs. 8as. per cent better than current?

(22) In 999 Moorshedabad rupees, at 11 per cent better than current, how many current rupees?

(23) What number of rupees of Moorshedabad should A. and B. answer for a bill drawn on them for 5000 current rupees, when the Moorshedabad rupees are 11 per cent better than current?

(24) How many current rupees must I credit A. and B. of Firkhabad, for 470 rupees of that place remitted to me at 12rs. 8as. per cent better than current rupees?

B E N G A L.

To reduce rupees in coin of one country to rupees of another country bearing different centages.

Rule.

Multiply the sum you want to reduce to any other kind by 100, increased by the centage of its own kind, and divide the product by 100 increased by the centage of that kind you would have it reduced to. The quotient will be the answer.

Prove this in this rule, by varying the questions.

(1) In Lucknow rupees, at 13 per cent better than

current rupees, how many sicca rupees, at 15 per cent better than current rupees?

(2) In 790 sicca rupees, how many Lucknow rupees, at 18 per cent better than current rupees?

(3) In 500 Madras Arcot rupees, how many sicca rupees?

(4) In 910 sicca rupees, how many arcot rupees?

(5) In Patna sonaut rupees 910 14s. 6p. how many Moorshedabad rupees?

(6) In Bombay coortie rupees 1640 15s. 3p. how many Mochedah rupees?

(7) In 810s.rs. 5s. 4p. how many Patna sonaut rupees?

(8) In Firkhabad rupees 373 10s. 4p. how many old sonaut rupees?

L O N D O N.

To change rupees into pounds sterling, and *vice versa*.

Rule.

To change rupees into pounds sterling, multiply the rupees given, by the pence given in 1 rupee, and divide by 12 and 20.

To change pounds sterling into rupees, reduce the pounds given to pence, and divide by the pence given in one rupee.

Prove questions in this rule by varying them.

(1) What is the value in current rupees, each 2s. 3d. of £.980 10s. 11d.?

(2) In 7513s.rs. 12s. 2p. how many pounds sterling, when the current rupee is valued at 2s. 3d.?

(3) Remitted 10,000 sicca rupees into the Company's Treasury at Calcutta, which I am to receive in London at 1s. 11d. per current rupee, what is the amount in pounds sterling?

(4) A bill drawn upon the Honourable Company's Treasury at Calcutta, for which I have paid at their house in London the sum of £.400 10s. 11d. is this

day to be paid, what am I to receive in sicca specie, the current rupee being valued at 2s. 2d. each?

(5) The amount of a bill presented to me for payment of some cordage which I have received, is £.730 2s. 6d. what is the amount in current rupees each valued at 2s. 3d. and how many sicca rupees must I pay him?

(6) The sum of a gunner's investment being disposed of to me is 350 pounds sterling, which I am to pay at 2s. 2d. per current rupee. What is the amount in currency?

(7) Purchased the Captain's investment of the ship Glatton at 75 per cent on the invoice, which amounts to £.8500 10s. what must I pay him in sicca specie, the current rupee being valued at 2s. 1d.?

(8) Twelve diamonds valued at 1500 sicca rupees each, are remitted to England, for which the owners are to receive sterling money, what will it amount to, the current rupee being valued at 2s. each?

(9) Purchased a quantity of stationery, prime cost in England 500 pounds, for which I am to pay 25 per cent, and some glass amounting to 750 pounds, which is to be paid for at 50 per cent upon the invoice, what am I to pay in sicca specie, when the current rupee is valued at 2s. 3d. each?

(10) Bought goods of A. and B. to the amount of 1100 sicca rupees to be paid in England at 2s. 1d. the current rupee, and the money bearing interest at 12 per cent, I demand the amount in sterling money, when the ship was just 7 months on her passage?

(11) An amount of an investment consigned to me is £.1000 sterling, what am I indebted in current rupees at 2s. 2d. each, after having sold the above at 55 per cent upon the invoice, and charging 1 per cent commission?

(12) Lent on respondentia at 25 per cent for the voyage, to the supercargo of the Danish Ship Princess of Augustenburg 4880 sicca rupees, what does

he stand indebted to me on his arrival at port, when the current rupee is valued at Rs. 3d.

M A D R A S.

Madras exchanges with Calcutta for the star pagoda, which at the par of exchange, is 345 Arcot rupees per 100 star pagodas.

They keep their accounts thus:

80 Cash,..... } make { ... 1 Fanam.
45 Fanams,..... } { ... 1 Star Pagoda.

To reduce Bengal money into Madras money, and vice versa.

Rule.

To reduce Bengal money into Madras money,

As 345 Arcot rupees are to 100 star pagodas, so are the Arcot rupees of the sum given, to its value, in star pagodas.

To reduce Madras money into Bengal money.

As 100 star pagodas are to 345 Arcot rupees, so are the pagodas given to their value in Arcot rupees, which must be reduced to the rupees required.

To prove sums in this rule, reverse the question.

(1) Calcutta draws upon Madras for 900 sicca rupees, what sum must Madras answer for that in star pagodas?

(2) Purchased 500 pagodas at Rs. 12s. per pagoda, what do they amount to?

(3) What sum in current rupees must I answer for a bill drawn on me for 520 star pagodas, exchange at par?

(4) To what amount in pagodas is my correspondent at Madras to credit me for, having remitted a bill payable to him for 406 current rupees, exchange at 345 Arcot rupees, per 100 star pagodas.

B O M B A Y.

Bombay exchanges with Calcutta for the rupee of that place, 100 of which, at the par of exchange, make 110 current rupees.

They keep their accounts thus:

100 Reas, make 1 Quarter Rupee,
4 Quarters, 1 Rupee Soortie.

Observe the same rule as in "Bengal."

(1) Drew upon my friend M. Hanley of Bombay for 5000 sicca rupees; what sum must he answer for that in rupees of that place; at 10 per cent better than current rupees?

(2) Paid a bill drawn upon me for 2000rs. 3qrs. 90 reas of Bombay; what must I charge the debtor for in current rupees?

(3) Consigned to M. H. at Bombay, 5000 maunds of salt petre, which he informs me he has disposed of in rupees of that place, at 3rs. 2qrs. 40 reas per maund, what sum in current rupees am I to charge him with, after allowing him a commission of 2 per cent on the sale?

(4) Remitted to J. B. at Bombay, a draft on a house there, for 2956 sicca rupees, what sum in Bombay rupees is he to credit me for?

Table of Exchange

Adopted for the adjustment of the Calcutta Customs.

Countries.	Coin.	Rates of Exchange.
Great Britain,	Pound Sterling, ..	at 10 Sicca Rupees.
Denmark,	Rix Dollar,	at 1 Sa. R. 10 As.
France,	Livre Tournois, ..	at 24 for 10 Sa. Rs.
Ditto,	Mauritius Livre, ..	at 48 for 10 Sa. Rs.
Spain,	Spanish Dollar, ..	at 2½ Sicca Rupees.
Portugal & Madeira, ..	Mil reas,	at 2½ Sicca Rupees.
China,	Tale,	at 3½ Sicca Rupees.
Madras,	Star Pagoda,	at 3½ Sicca Rupees.
Ditto,	Swamy Ditto, ...	at 4 Sicca Rupees.

American Currency to be converted into Pounds Sterling, as follows:

New-England, by multiplying by 3, and dividing by 4.

Virginia, ditto.

New-York, by multiplying by 9, and dividing by 46.

Pennsylvania, ditto by 3, ditto by 5.

South-Carolina, by deducting 1—27th part.

Georgia, ditto.

The pound sterling to be rated, as above, at 10 sicca rupees.

Where the invoices are in dollars, the dollars to be rated at $2\frac{1}{4}$ sicca rupees.

Comparison of Weights and Measures.

Note 1. 80 Sicca wt. are 1 Calcutta seer.
 60 ditto, 1 Serampore ditto.
 82 ditto, 1 Hooghly ditto.
 84 ditto, 1 Benares ditto.
 96 ditto, 1 Ennahabad ditto.
 84 ditto, 1 Mirzapore ditto.
 96 ditto, 1 Lucknow ditto.

72 ditto, 11 annas, 12 gundas, 2 cowries, 1 factory ditto. A sicca being equal to 74 dwts. $11\frac{1}{2}$ grains troy.

Note 2. The factory maund, as settled by the merchants of Calcutta, is equal to 2909 sa.wt. 1a. 10gnd. or lbs. 74,666 or 10oz. 10,666dwts which makes the seer equal to sa.wt. 72, 11a. 12g. 2c. or lbs. 1,8666 or 1 lb. 13oz. 13,866dwts. and the chahtack equal to 4 sa.wt. 8a. 14gs. 2c. or lbs. 11666 or 1oz. 12,866dwts.

A bazar maund is 10 per cent more than a factory maund, and equal to 3200sa.wt. or lbs. 82,1333 or 2oz. 2,133dwts.

A bazar seer is equal to 80sa.wt. or lbs. 2,05333 or 2lbs. 0oz. 13,6533dwts. and the chahtack equal to 5sa.wt. or lbs. 1,2833 or 2oz. 0,8533dwts.

Cwt.	Srs.	Cks.	F.md.	Srs.	Cks.
1 1lb. }	is equal to	{ 1 br.md. 14 8,7273 }	or	{ 1 20 0 }	
		{ 7,7922 }		{ 0 0 8,57 }	

36 srs. 5 cks. $\frac{1}{2}$ bazar weight, is equal to 1 factory md.

1 maund bazar weight, = 44 factory seers.

10 bazar maunds, = 11 factory maunds.

1 md. 20 srs. factory weight, = 1 cwt.

3 mds. factory weight, = 2 cwt.

15 mds. bazar weight, = 11 cwt.

CASE 1.—To change maunds of one place, into maunds of another place.

Rule.

As I seer of the weight given ; is to its siccas :: so is the weight given ; to its siccas, which divide by the siccas in a seer of the place you wish to change them to, will give the answer sought in seers of that place.

(1) In 500mds. 20srs. of Lucknow, how many Calcutta maunds?

(2) In 875mds. 10srs. 14cks. of Lucknow, at 96 siccas per seer, how many Calcutta seers?

(3) In 10mds. 5srs. 8cks. of Hooghley, how many Calcutta maunds?

(4) If 75 maunds of Bengal are equal to 125 maunds of Bombay, how many maunds of Bengal will make 5965 maunds of Bombay?

(5) In 500 Hooghley maunds, how many Calcutta maunds?

CASE 2.—To change factory maunds into bazar maunds, and *vice versa*.

Rule.

To change factory maunds into bazar maunds.

Multiply by $\left\{ \begin{smallmatrix} 10 \\ \text{or} \\ 40 \end{smallmatrix} \right\}$ and divide by $\left\{ \begin{smallmatrix} 11 \\ \text{or} \\ 44 \end{smallmatrix} \right\}$

To change bazar maunds into factory maunds.

Multiply by $\left\{ \begin{smallmatrix} 11 \\ \text{or} \\ 44 \end{smallmatrix} \right\}$ and divide by $\left\{ \begin{smallmatrix} 10 \\ \text{or} \\ 40 \end{smallmatrix} \right\}$

2dly. By reducing the weight given into siccas, according to case 1st. or 3dly. to reduce bazar maunds into factory maunds by adding 10 per cent to the weight given.

(1) In 980mds. 10srs. bazar weight, how many maunds factory weight?

(2) If 40srs. of bazar weight are equal to 44srs. factory weight, how many bazar srs. are in 99mds. 10srs. factory weight?

(3) In 89mds. of Lucknow, how many factory maunds are there?

(4) In 510mds. 30srs. factory weight, how many Hooghley seers are there?

(5) Required the factory weight of 100 bazar maunds of copper?

CASE 3.—To change maunds into Avoirdupois weight, and *vice versa*.

Rule.

To bring factory weight into Avoirdupois weight.

1 f. md. 20 srs. : 1 cwt. }
3 f. mds. : 2 cwt. } :: the factory weight given : to the factory weight required.

To bring Avoirdupois weight into factory weight.

1 cwt. : 1 f. md. 20 srs. }
2 cwt. : 3 f. mds. } :: the Avoirdupois weight given : to the factory weight required.

To bring bazar maunds to Avoirdupois weight.

15 b. mds. : 11 cwt. or 1232 lbs. :: the weight given : to the Avoirdupois weight required.

To bring Avoirdupois weight to bazar weight.

11cwt. or 1232lbs. : 15mds. :: the Avoirdupois weight given : to the bazar weight required.

(1) How many pounds Avoirdupois weight are in 1078mds. 11srs. factory weight?

(2) Required the Avoirdupois weight of 980mds. 10srs. bazar weight?

(3) In 9 tons of iron, Avoirdupois weight, how many factory maunds?

(4) In 270 maunds actory weight, how much Avoirdupois weight?

(5) Required the bazar weight of 100 tons of lead?

(6) How many lbs. Avoirdupois weight are in 2727mds. 10srs. 14cks. bazar weight?

Case 4.—To change Bengal weights into Madras, and vice versa.

10 Pagodas weight make	1 Pollam,
40 Pollams,	1 Vis,
8 Vis,	1 Maund of 25lbs.
	Avoirdupois wt.
20 maunds,	1 Candy = 500 lbs.
8 measures, of 2lbs. 10oz. each,	1 Marcal, or 21 lbs.
400 Marcals,	1 Garse = 8400 lbs.
	or 336 Madras maunds.

Note. 375 bazar maunds are equal to 1232 Madras maunds.

75 factory maunds, = 224 Madras maunds.

Rule.

As 375 B. mds. : 1232 M. mds. :: B. mds. given : to M. mds. required.

As 1232 M. mds. : 375 B. mds. :: M. mds. given : to B. mds. required.

As 75 F. mds. : 224 M. mds. :: F. mds. given : to M. mds. required.

As 224 M. mds. : 75 F. mds. :: F. mds. given : to F. mds. required.

(1) Sent to Madras 500 bazar maunds of tamarinds. What is the weight in candies of that place?

(2) Received from my correspondent 500 bags of chink each 2mds. 4vis. how many bazar mds. does it come to?

(3) In factory mds. 8942, 20srs. how many Madras maunds?

(4) In Madras candies 1335, 8m. 2vis. 5pol. how many factory maunds?

(5) In 500 bags of Patcherry rice sent to Madras, each containing $2\frac{1}{4}$ bazar maunds, how many garse are there?

Case 5.—To change Bengal weights into Bombay weights, and vice versa.

15 pice, make 1 Seer, = 15 Avoirdupois.
 40 Seers, 1 Maund, = lbs. 38 Avoirdupois.
 20 Maunds, ... 1 Candy, = lbs. 760 Avoirdupois.
 1 Bombay md. of 38 } = 52,114 bazar mds.
 lbs. Avoirdupois } = 1,965 factory mds.

Rule.

As 1 maund of the weight given
 Is to its Avoirdupois weight;
 So is the weight given,
 To its Avoirdupois weight
 which being divided by the Avoirdupois weight of
 the maunds you would reduce them to, produces the
 weight required.

(1) Received as per invoice 250 candies of cotton,
 from Bombay, required the Calcutta bazar weight
 of it?

(2) Received from Bombay 2313b.mds. 12srs.
 14cks. how many Bombay candies must that have
 been reckoned in the invoice?

(3) Sent to Bombay 9876f.mds. 30srs. of toota-
 nague, required the weight of that place?

(4) My correspondent at Bombay sends me word
 that he has received 97 candies, 31srs. of tootnague
 on my account, which I invoiced to him in factory
 maunds: how many factory maunds there were is
 required?

(5) Sent to Bombay 500 bazar maunds of salt-
 petre, which stood me in four sicca rupees per maund,
 and which my agent there informed me he disposed
 of on my account, at 2rs. 3qrs. 50 reas of that place,
 per Bombay maund: required the amount sale of the
 same, and the profit or loss upon the whole?

REBATE OR DISCOUNT,

Is an abatement of a sum of money due at any time
 to come, in consideration of present payment, which

should be as much as being put out to interest, would amount to the given sum in the same space of time.

Rule.

As 12 months
Are to the rate per cent
So is the time proposed
To a fourth number.

Then add that fourth number to 100 rupees, and

As that sum
Is to the fourth number;
So is the given sum;
To the rebate.

Subtract the rebate from the given sum, and the remainder is the present worth. Or,

As that sum
Is to 100 rupees;
So is the given sum
To the present payment.

Subtract the present payment from the given sum, and the remainder is the rebate.

When any sum of money is to be paid at several times, find the rebate or present worth of each particular payment separately, and add them together.

To prove questions in this rule, find the amount of the present payment at the time and rate per cent given, and that will be equal to the given sum.

(1) How much ready money ought I to receive for a note of 795rs. 10as. 4p. due 15 months hence, discounting at the rate of 9 per cent per annum?

(2) Suppose 810 rupees are to be paid 3 months hence, allowing 5 per cent discount, what will be the rebate?

(3) Suppose 18 months hence a bill of 987rs. 8as. will be due to me, how much can I receive at present, if I allow my debtor 10 per cent discount?

(4) If a legacy of 1000rs. is left me July the 24th 1808, to be paid on the Christmas day following,

what must I receive, when I allow 6 per cent for present payment?

(5) Being obliged by a bond bearing date August the 29th 1808, to pay next midsummer 14590 rupees, what must I pay down, if I am allowed discount after the rate of 12 per cent per annum?

(6) Sold goods for 3120 rupees to be paid at two three months, that is, half at 3 months, and the other half at 3 months after that, what must be discounted for present payment at 5 per cent?

(7) Sold goods for 3000 rupees to be paid at three two months, that is, one third at two months, one third at four months, and one third at six months, what must be discounted for present payment at four per cent?

(8) What is the present worth of 1000 rupees at 5 per cent, payable at two four months?

(9) I would know the present worth of 15000 rupees payable at three four months, at 5 per cent discount?

(10) What is the present worth of 20,000 rupees at four per cent, payable as follows, viz. 10,000 rupees at 2 months, 5000 rupees at 3 months, and 5000 rupees at 5 months?

(11) Sold goods amounting to 2170rs. 10s. 4p. half payable at three months, and the other half at three months after, how much am I to receive, when I allow discount at 5 per cent per annum?

(12) What present money will discharge a debt of 1120rs. 8s. 6p. due at 3 months, discounting after the rate of 6 per cent?

(13) Bought goods of P. Price, shop-keeper, to the amount of 1000 rupees, for which I gave him a treasury order amounting to 1500 rupees, discount allowed at 15 per cent; I desire to know how much he or I stand indebted?

(14) Sold goods to Col. Macleod, to the amount of 750 rupees, for which I am to receive a bill on the Company's treasury, and to be allowed a discount of

15 per cent, I desire to know how much it must amount to?

(15) Bought of Lieutenant James Gouldhawke, a bill on the general pay-master, amounting to 750 rupees, what am I to pay for it, when he allows me a discount of 14 per cent?

(16) Bought a Company's bond amounting to 5000 rupees, bearing interest at 8 per cent from the 1st of January 1806, to the 1st of January 1809, paid ready money for the same, after being allowed a discount of 25 per cent. The question is, how much ready money was paid, supposing this to be the 1st of July 1807, and what shall I clear, if I receive payment when due?

(17) How much will it save me to pay a debt of £.25 now, which I intended to pay in 14 weeks time, discount being allowed at 12 per cent per annum?

(18) Suppose I buy £.296.14s. worth of hose, and am to have 12 months credit, or 11 per cent discount, I agree to take 8 months credit, and receive discount for the other 4 months, but on reflection I think proper to pay ready money; how much shall I save by the latter determination?

EQUATION OF PAYMENTS,

Is when several sums of money, to be paid at different times, are reduced to one mean time for the payment of the whole, without loss to either debtor or creditor.

Rule

Multiply each payment by its time, and divide the sum of all the products by the whole of the debt, the quotient is the equated time.

(1) A owes B, 1000 rupees, whereof 500 are to be paid at 2 months, and 500 at 4 months; but they

agree to reduce them to one payment, when must the whole be paid?

(2) A merchant has owing him 30000 rupees, to be paid as follows: 5000 at 2 months, 1000 at 5 months, and the rest at 8 months; and it is agreed to make one payment of the whole: I demand when that must be?

(3) K. is indebted to L. a certain sum, which is to be discharged at 4 several payments, that is, $\frac{1}{4}$ at 2 months, $\frac{1}{4}$ at 4 months, $\frac{1}{4}$ at 6 months, and $\frac{1}{4}$ at 8 months; but they agreeing to make but one payment of the whole, the equated time is therefore demanded?

(4) H. bought of X. a quantity of goods on trust for which H. was to pay $\frac{1}{3}$ of the debt every 3 months, until the whole should be discharged; but they afterwards agreed to pay the whole at one equated time; the time is demanded?

(5) B. owes C. 4200 rupees, which will be due 6 months hence; but B. is willing to pay him 600 rupees now, provided he can have the rest forborn a longer time: it is agreed on: the time of forbearance is therefore required?

(6) L. owes me 5000 rupees payable in 4 months, and 5000 rupees payable in 6 months, and C. owes me 5000 rupees payable in 8 months, and 5000 rupees payable in 10 months: what will be the equated time for the payment of each person's money?

(7) A. owes B. 20000 rupees, whereof 5000 rupees are to be paid down, 5000 rupees at the end of 3 months, 5000 rupees at the end of 6 months, and 5000 rupees at the end of 9 months; but as they agree to make but one payment, when will it be due?

(8) A person dying bequeaths to a younger son 10000 rupees, to be paid as follows, viz. 3000 rupees at one year's end, 3000 rupees more at a year and a half, and the remainder at the end of 2 years and a half; now the executor agrees with the legatee to pay the whole at one payment; how long from the death of the father must this payment be, so that neither party be wronged or suffer loss?

COMPANY,

OR

SINGLE FELLOWSHIP.

By Single Fellowship is adjusted the accompts of such partners, as put all their several, and perhaps different sums of money into one common stock at the same time, and therefore it is usually called, the rule of Fellowship without time. By it, the estate of a bankrupt may be divided among his creditors, and legacies may be adjusted, when there is a deficiency of assets, or effects.

Rule.

As the sum of the several stocks,

Is to the total gain or loss;

So is each man's share in stock,

To his share of the gain or loss.

To prove questions in this rule, add all the shares together, and the sum will be equal to the given gain or loss.

(1) A. and B. were sharers in a parcel of merchandize, in the purchase of which A. laid out 30 rupees and B. 70 rupees, and the commodity being sold, they find their clear gain amount to 250 rupees; what part of it must each man have?

(2) A. B. and C. trading together, gained 1200 rupees, which is to be shared according to each man's stock; A. put in 1400 rupees, B. put in 3000 rupees and C. put in 1600 rupees, required each man's share?

(3) Three merchants trading to Madras lost goods to the value of 8000 rupees: now if A.'s stock was 12,000 rupees, B.'s 4800 rupees, and C.'s 2000 rupees, what sum did each merchant lose?

(4) Four men traded with a stock of 8000rs. and

they gained in two year's time twice as much, and 400 rupees over. A.'s stock was 1400 rupees, B.'s 2600, and C.'s 3000 rupees. I demand D.'s stock, and what each man gained by trading?

(5) A. B. and C. freight a ship from Madeira to Calcutta with 108 tuns of wine, of which A. sent on board 48 tuns, B. 36, and C. 24; but by reason of bad weather 45 tuns were thrown overboard: how much must each sustain of the loss?

(6) A merchant is indebted to P. 700 rupees, to Q. 4000 rupees, and to R. 1400rs. 8as. but upon his decease, his estate is found to be worth no more than 4090rs. 14as. How therefore must it be divided among them?

(7) If the money and effects of a bankrupt amount to 1400rs. 8as. 6p. and he is indebted to A. 7420rs. 12as. to B. 6410rs. 4as.; and to C. 9870rs.; how must it be divided among them?

(8) A. hath in stock 350rs. and B. 200rs. They trade and gain 400 rupees, and agree, it shall be divided so, that A. is to have 10 per cent on his venture; but B. only 8 per cent; what must each have of the gain?

(9) A. B. and C. put in money together; A. put in 200rs. B. and C. put in 850rs.; they gained 630rs. of which B. took up 210rs. what did A. and C. gain, and B. and C. put in?

(10) Some others advance in trade as follows: W. X. and Y. raised 3500rs. 10as. W. X. and Z. 3448rs. 10as. X. Y. and Z. made up together 3780rs. 4as. and W. Y. and Z. contributed 4000rs. In the conclusion they parted with their joint property for 4500rs. what did they gain or lose by the adventure?

(11) A. B. and C. put in trade 3600rs. and gained 2700rs. of which as often as A. took up 30rs. B. took up 50rs.; and as often as B. took up 50rs. C. took up 70rs.; what did each put in and gain?

(12) A. B. and C. put in money together; A. put in 200rs. B. 300rs. and C. a sum unknown; they

gained 360rs. whereof C. took 160rs.; what did A. and B. gain, and C. put in?

(13) A. B. C. and D. put in money together, and gained a sum, of which A. B. and C. took 600rs. B. C. and D. took 900rs. A. C. and D. took 800rs. and A. B. and D. took up 700rs. what distinct gain did each take up?

(14) A. and B. cleared by an adventure at sea 500rs. with which they agreed to buy a horse and buggy, whereof they were to have the use in proportion to the sums adventured, which was found to be A. 10, to B. 7; they cleared 45 per cent, what money did they send abroad?

(15) Three merchants having gained in partnership 36000rs. hence arises the question to know what was each merchant's share of the profit, and what was his stock separately, knowing only that the stock and profit of the first together is 57600rs.; of the second 72000rs.; and of the third 86400rs.

(16) Three ground renters pay among them 1200rs. for a spot of ground, into which they sow 3000 mounds of paddy, whereof A. had 800mds. B. 1000mds. and C. 1200mds. how much had each to pay?

(17) Divide 1000rs. so that A. may have $\frac{1}{2}$, B. $\frac{1}{3}$, and C. $\frac{1}{6}$, and tell me each man's quota?

(18) A bankrupt's money and effects amount to 5110rs. 10as. and he owes as follows: to Mr. Maclean 2200rs. 8as. 3p. Mr. Trench 3120rs. Mr. Porter 1170rs. 6as. 3p. Mr. Price 1060rs. 6as. 3p. Mr. Daveron 2000rs. 6as. and Mr. Linstedt 1240rs. 6as. 6p. What is each person's proportion of the bankrupt's present property?

COMPANY WITH TIME, OR DOUBLE FELLOWSHIP.

Compound Fellowship is when the stocks continue an unequal term of time.

Rule.

- 1st. Multiply each man's stock and time together.
- 2dly. Add the several products thence arising together.
- 3dly. As the sum of those products,
Is to the whole gain or loss;
So is each product,
To its share of the gain or loss.

These questions are proved as in **Single Fellowship**.

(1) Three merchants traded together. A. put in 1200rs. for 9 months, B. 1000rs. for 16 months, and C. 1000rs. for 14 months, and they gained 1000 rupees; how must it be divided?

(2) Three merchants join in trade. A. put in 4000rs. for 9 months, B. 6800rs. for 5 months, and C. 1200rs. for 12 months, but by misfortune they lost goods to the value of 5000 rupees: what must each man sustain of the loss?

(3) A. B. and C. hold a godown in common, for which they pay 20rs. per month. In this godown A. had 400 maunds of rice for 76 days, B. had 360 maunds for 50 days, and C. had 500 maunds for 90 days: I demand what part every of these tenants ought to pay of the 20 rupees?

(4) A. and B. enter into company: A. put into stock 1200rs. for 7 months, and B. put in 2300rs. for 10 months, and in trading they gain 1000rs. what is each man's share, in proportion to his stock and time?

(5) Three persons enter into partnership, viz. A. B. and C.—A. puts into stock 650rs for 8 months; B. 780rs. for 12 months; and C. 840rs. for 6 months; and they gain 1660 rupees; what is each man's share?

(6) Three merchants accompany for some time; A. puts in 4870rs. 10as. 6p. for 4 months; B puts in 9470rs. 8as. for 6 months, C. puts in 7970rs 12as. for 8 months; and they gained 97480rs. 12as I would know each man's share of this gain?

(7) A. B. and C. commence a partnership the 1st of January for a year. A. the same day pays in his stock of 1000rs. and withdraws again the 1st of April, 200rs. B. pays in on the 1st of March 600rs. and on the 1st of August 1000rs. more: C. pays to the stock the 1st of July 1400rs. and the 1st of October withdraws 400r At the year's end the clear gain is 1420rs. Query? What is each person's share of that gain?

(8) Three persons A. B. and C. entered into partnership, thus: A put in 500rs. for 6 months, B. put in 700rs. for 10 months, and C. put in 900rs. for 8 months: with this they traffick, and gain 1660rs. 12as. 9p. I demand each man's share of the gain in proportion to his stock and time of employing it?

(9) Three men joined their stocks together, and purchased a quantity of rice, which they sent to Madras; the profit of the voyage amounted to 25000rs; but as the co-partners did not put in equal stocks, so the profits could not be shared equally; the first partner put in 20,000rs. for 6 months, the second put in 25,000rs. for 8 months, and the third put in 15,000rs. for 10 months: now I desire to know, what sum each partner will receive?

BARTER.

When merchants &c. exchange one commodity for another, it is called bartering, the price and quantity

of the goods so exchanged are then determined, so that neither party shall sustain a loss by such traffick.

Rule.

First calculate the price of those goods, of which the quantity is given, which amount must be divided by the other quantity, if any given, to find their price, or by the price of the other goods, when given, to find their quantity.

(1) A. and B. bartered. A. had 120 maunds of cloves worth 6rs. 4as. per seer, for which B. gave him 85 maunds of cinnamon: I demand how B. rated his cinnamon per seer?

(2) A. and B. bartered A. had 60 maunds of ghee at 12 rupees per maund: for which B. gave him 200 rupees in money and the rest in dates, at 20 rupees per maund. I demand how many dates B. gave A. besides the 200 rupees?

(3) C. has candles at 2 rupees per dozen, ready money; but in barter he will have 2rs. 2as. D. has cotton at 14 rupees per maund, ready money; I demand what price the cotton must be at in barter? Also, how much cotton must be bartered for 100 dozen of candles?

(4) How many tubs of China sugar must be bartered for $10\frac{1}{4}$ chests of tea, each 95 rupees, when the sugar is worth no more than 14 rupees per tub?

(5) A merchant barter 10 pieces of drugget, each 25 yards, at 1r. 9as. per guz; against pepper at 23rs. 8as. per maund. The question is, how many maunds of pepper must he receive?

(6) A merchant has 1000 guz of canvas at 6as. per yard, which he barter for dungaree at $1\frac{1}{2}$ as. per cubit; how many yards must he receive?

(7) A. has silk at 5 annas per seer; B. has cloth at 10 rupees the yard, which he barter at 12 rupees per yard; at how much must A. put his silk, to make his profit equal with B.?

(8) B. has 100 corgs of muggirdooties worth 27rs. 8as. per corg, which he barter with C. thus:

to have 1000 rupees in money, and the rest in sannas at 18 rupees per piece, how many pieces should he receive?

(9) A. has coffee, which he barter with B. at 3 annas per seer more than it cost him, against tea, which stands B. in 5rs. per seer, but put it to 5rs. 8as. I would know how much the coffee cost at first?

(10) Bartered 100 pieces of long-cloth at 75 rupees per piece, against shawl handkerchiefs at 80 rupees per pair; how many handkerchiefs am I to receive?

(11) Suppose A. has a quantity of cossaes, at 18 rupees per piece, which he would truck with B. for 50 pieces of muslin, at 50 rupees each, and 130 pieces of chintz at 8 rupees each; how many pieces of cossaes must he return?

(12) A. has 5 bales of pepper weight neat 40 maunds, at 22rs. 12as. per maund, which he barter with B. for two sorts of goods, the one at 8 annas and the other at 5 annas per seer, to have a third in money, and of each sort of goods an equal quantity. I demand how many seers of each sort of goods he is to receive, and how much money?

(13) A. has broad-cloths, each 25 yards, at 5rs. 8as. per yard, and B. has salt-petre at 5rs. per maund; how many maunds of salt-petre must be given for 24 pieces of broad-cloth?

(14) B. has 5000 sheathing boards at 23 rupees per corge, and C. has 200 timbers at 18 rupees per piece, which they agree to give to D. for a quantity of beetlenut, at 7 rupees per maund; how much must each person receive for his share?

(15) A. has 120mds. of tootanague, at 16 rupees per maund, which he is willing to barter with C. for a quantity of iron, at 8 rupees per maund; how many maunds should A. receive, if C. agrees to the proposal?

(16) D. and C. bartered thus; D. gave 120mds. 10rs. of sugar, value 7rs. 4as. per maund, to C. for 15½ maunds of cinnamon; what was the cinnamon rated at per maund?

(17) A. and B. bartered; A. has 86 gallons of brandy, worth 3rs. 4as. per gallon, ready money; but in barter he will have 3rs. 8as. per gallon, and B. has cassimere worth 5 rupees per yard, ready money: Query? How many yards of cassimere must B. give A. for his 86 gallons of brandy, and what is the price of the cassimere in barter?

(18) Two merchants, A. and B. bartered; A. would exchange 20 maunds of nutmegs at 84 rupees per maund, for 18 pieces of Madras cloth, at 80 rupees per piece; I demand who stands debtor; and how much?

(19) A. and B. bartered. A. has 1000 yards of broadcloth, at 9 rupees per yard; but in barter he will have 10rs. 8as. and will also have a quarter of the barter value in ready money; and B. has salt at 2rs. 2as. per maund; how much salt ought B. to deliver, and how is it to be raised to equal the barter price of the broadcloth?

(20) A. has 40 cloths, at 95 rupees per piece, ready money. In barter they are charged by him at 100 rupees per piece, but half of that is required in cash. B. has flax at 3 seers per 1 rupee; how ought he to rate it in truck, not to be hurt by the extortion of A. and how much flax must he give him?

PROFIT AND LOSS,

Is the rule by which we find what is gained or lost by the sale of any commodities, having the price known, and regulating the sale of them, so that we may not injure our customers by being exorbitant, or ourselves by fixing the price too low.

Rule.

Calculate the cost and sale, and the difference between them will give the loss or gain.

(1) Bought 12 pieces of white cloth for 20 ru-

pees per piece, paid 5 rupees a piece for dying: at how much must I sell them per piece to gain 20 per cent, and what is the amount, cost, and sale of the whole?

(2) Suppose I buy 28 pieces of goods at 72rs. per piece, and sell 10 pieces at 80rs. and 8 at 90rs.; at what rate must I sell the rest, to gain 10 per cent by the whole?

(3) Having sold a yard of cloth for 10rs. 8as. I gained at the rate of 15 per cent; but if I had sold it for 12rs. what should I have then gained per cent?

(4) Bought 14 pipes of wine at 432rs. per pipe, which I sell immediately after for 472rs. what is the whole gain, and how much per cent?

(5) Bought a tun of wine for 800rs. ready money, sold it for 900rs. payable in 8 months time. I demand how much per cent per annum I shall clear?

(6) Having bought a parcel of goods for 1000rs. and sold the same immediately for 1120rs. with 4 months credit, what is gained per cent per annum?

(7) Bought 40 gallons of brandy at 3rs. per gallon; by accident 6 gallons of it were lost, at what rate may I sell the rest with 8 months credit, and gain upon the whole prime cost at the rate of 10 per cent per annum?

(8) Bought 100 skins of raisins at 2rs. each payable in 9 months; sold them for 2rs. 4as. payable in 15 months; what is the profit per cent per annum, at that rate?

(9) Suppose I have goods to the value of 5796rs. 10as. 6p. that come to a bad market, and know that they impair by lying, I therefore am obliged to sell them at 12 per cent loss; what come they to?

(10) A man buys cotton for 6rs. a maund, which not proving so good as was expected, would put it off again, so as but to lose 6 per cent by it, what is the selling price?

(11) A man buys 2000 bazar maunds of pepper, with which he went to Madras, it cost him 3sa. rs. 4as. per bazar maund, the freight and custom came

to 150rs. his own expences and charges were 216 sa.rs. 13as. 4p. for how much must he sell it per Madras maund, in arcot rupees, to gain 20 per cent?

(12) If my factor at Madras returns me 800 barrels of anchovies, each weighing 14 seers, which stand me here in $12\frac{1}{2}$ annas per seer, in lieu of 7490 seers of salt-petre, and I find that I have gained after the rate of 17 per cent by the said consignment: pray how was my said salt-petre invoiced per seer to the factor, that is, what was the prime cost?

(13) Having bought 160 gallons of French brandy at 2rs. 8as. per gallon, there chanced to leak out 18 gallons; at what rate per gallon may I sell the remainder with 8 months credit, so as to gain upon the whole prime cost, at the rate of 12 per cent per annum?

(14) Having paid 14as. a yrd for 100yds. of cloth, I propose to gain 25 per cent ready money, and if I sell it upon time to have moreover 10 per cent per annum on the ready money price, for the forbearance, what must be the price of one yard, with 6 months credit, to make both these gains?

(15) Laid out in a lot of muslin 480rs. 12as. upon examination of which 2 parts in 7 proved damaged, so that I could make but 5as. 6p. a yard of the same, and by so doing find I lose 4rs. 10as. by it, at what rate per yard am I to part with the undamaged muslin, to make up my said loss?

(16) A draper bought 100 yards of long-cloth, for which he gave 560 rupees, I desire to know how he must sell it per yard to gain 190 rupees on the whole?

(17) A vintner buys a quantity of brandy at 2rs. 8as. per gallon, payable at six months, and sells the same at 3 rupees per gallon, payable in ten months: how much per cent does he gain at that rate, per annum?

(18) A merchant buys 10 cases of sago weight 40 mds. 13srs. at 6rs. 2as. per maund, payable in 3 months, sells it for 4 annas a seer, payable in 7mos. Tell me how much per cent per annum is gained, at that rate?

(19) A merchant receives from Bussorah 180 casks of raisins, which stand him here in 16 rupees each, trucks them against other merchandize at 28rs. per maund, by which he gained 25 per cent profit. I demand the weight of each cask, one with another?

(20) A merchant sends to Madras 500 pieces of chintz at 18rs. 8as. each, pays for duty and other charges 109rs. 10as. 8p. his correspondent at Madras sells the chintz at $6\frac{1}{2}$ pagodas per piece, pays for freight &c. 50 Arcot rupees, and takes 5 per cent for his commission; I demand the loss or gain, when 100 pagodas are worth 345 Arcot rupees?

(21) Sold a repeating watch for 50 guineas, and by so doing lost 17 per cent, whereas I ought in dealing to have cleared 20 per cent; how much was it sold for under the just value?

(22) Bought hose in London at 4s. 3d. per pair, and sold them afterwards in Dublin at 6s. the pair; now taking the charge at an average to be 2d. the pair, and considering that I must lose 12 per cent by remitting my money home again, what do, I gain per cent by this article of trade?

(23) Bought 40 gallons of brandy at 3s. per gallon, but by accident 6 gallons of it were lost; at what rate must I sell the remainder per gallon, to gain upon the whole prime cost, at the rate of 10 per cent?

(24) I purchased an invoice of Europe goods amounting to £500 at 50 per cent advance, allowing 2s. 3d. per current rupee. I sold the whole at the rate of 1 sicca rupee on every shilling on the original amount £500: what did my gain amount to, and how much per cent?

IMPORTS AND EXPORTS.

In casting up the amount of goods bought, imported or exported; to the prime cost of such goods, we

must add all the charges upon them, in order to fix the price they stand us in.

(1) Suppose I import from Madras 5 bales of paper, each bale 10 reams, which, with charges there, amounted to 820 rupees, I pay duty here, 6 annas per ream, and for freight 40 rupees: what does this paper stand me in per ream, and how must I sell it per ream, to gain 10 per cent?

(2) Suppose a bale of merchandize weighed 7mds. 20rs. and cost me 304 rupees, I pay for duty 2 annas per seer: for freight 14 rupees, and for coolies home 12 annas: how much will 1 seer of the merchandize stand me in?

(3) Imported 4 pipes of linseed oil containing 480 gallons, which cost 4rs. 1a. per gallon, paid for freight 4 rupees per pipe, duty 2 annas per gallon, cooley hire $1\frac{1}{2}$ rs. per pipe: what must I sell it for per gallon to gain 12 per cent?

(4) Bought 150 casks of porter, each 32 gallons, for 84 rupees per cask, paid custom 5as. per cask, cooley hire 2 annas per cask; the godown rent came to 30rs. cooperage 37rs. 4as. When I sell them for 15000 rupees, what do I gain upon the whole, per cask, and per cent?

(5) Bought 200 carcasses of beef, weight neat 474mds. 10rs. 8cks, at 3rs. 8as. per maund, and salted them up in 400 barrels, which cost 3rs. 4as. a piece, paid for 50mds. of salt, at 4rs. 12as. per maund, paid for salting, coolies, &c. 25 rupees: now I want to know, what one barrel stands me in?

(6) Shipped for Madras 1200 bags of rice, which cost me 2rs. 8as. per bag; paid for 1200 gunny bags at 2 annas each; for packing 3 pice per bag; cooley hire to the custom house ghaut 6 pice per bag, for licence, duty, and other port charges, 210rs. 8as. 6p. boat hire 11 rupees. I desire to know what it stands me in per bag, on board?

(7) Imported from Madras 20 pipes of wine, at 180 rupees per hogshead, paid duty here, 1 anna per gallon, freight 25 rupees per tun, the charges for

boat and cooley hire came to 18rs. 8as. A storm arising, 1 pipe containing 126 gallons was thrown overboard: what does the remainder stand me in per gallon, how must I sell it per hoghead to gain 10 per cent, and what do I gain by the whole at that rate?

(8) Shipped on board the snow, Admiral Hughes, 20 bales muggirdooties, each 5 corge, each 32rs. 8as. paid charges as follows: godown rent for 1 month previous to the embarkation, 30rs. paid for 10 pieces dungaree, each 2 rupees; packing ditto, 4 annas per bale; custom, 4 rupees per corge; boat and cooley hire, 20 rupees. What come they to per corge?

(9) Purchased 300 maunds of long-pepper at 3 rupees per maund, packed them in bags, each 3 maunds; paid for bags, 2 annas each; packing ditto, 3 pice each; godown rent came to 10 rupees; exported the whole to Madras; paid customs, 8 annas per bag, cooley hire, 6 pice per bag, and boat hire 5 rupees: how must I charge them per bag to gain 30 per cent upon the whole?

PART II.

VULGAR FRACTIONS.

FRACTIONS are of two kinds, viz. Vulgar and Decimal—A vulgar fraction is a broken number, and signifies the part or parts of a whole number. Any numbers placed thus, $\frac{5}{8}$, make a vulgar fraction, the upper number being the remainder after division is called the numerator, and the lower number, which notes any whole divided into two parts, is the divisor in division, and is called the denominator. There are three sorts of Vulgar Fractions, viz. proper, improper and compound. A proper fraction is, when the numerator is less than the denominator, as $\frac{5}{8}$, and may be expressed without end, as $\frac{1}{2}$ may be called $\frac{1}{2}$ or $\frac{2}{4}$ or $\frac{3}{6}$ &c. but the lowest term $\frac{1}{2}$ is always desired—An improper fraction, is when the numerator is greater than the denominator, as $\frac{3}{2}$, and a compound fraction is the fraction of a fraction, as $\frac{1}{2}$ of $\frac{2}{3}$, or $\frac{1}{3}$ of $\frac{1}{4}$ of $\frac{1}{5}$, &c.

REDUCTION OF VULGAR FRACTIONS.

CASE 1 —To reduce Vulgar Fractions to a common denominator.

Rule.

1st. Multiply each numerator into all the denominators but its own for a new numerator.

2dly. Multiply all the denominators for a common denominator.

- (1) Reduce $\frac{1}{2}$ and $\frac{1}{3}$ to a common denominator.
- (2) Reduce $\frac{1}{2}$ and $\frac{1}{4}$ to a common denominator.
- (3) Reduce $\frac{1}{2}$ and $\frac{1}{5}$ to a common denominator.
- (4) Reduce $\frac{1}{2}$ and $\frac{1}{6}$ to a common denominator.
- (5) Reduce $\frac{1}{2}$ and $\frac{1}{7}$ to a common denominator.
- (6) Reduce $\frac{1}{2}$ and $\frac{1}{8}$ to a common denominator.

CASE 2.—To reduce a Vulgar Fraction to its lowest terms.

Rule.

1st. Find a common measure by dividing the lower term by the upper, and that divisor by the remainder following, till nothing remains. The last divisor is the common measure.

2dly. Divide both parts of the fraction by the common measure, and the quotients will make the fraction required.

Note 1st. If the common measure happen to be 1, the given fraction is already in its lowest terms.

2dly. When a fraction has cyphers at the right hand, it may be abbreviated by cutting them off thus $\frac{1}{2}$.

- (1) Reduce $\frac{1}{2}$ to its lowest terms.
- (2) Reduce $\frac{1}{3}$ to its lowest terms.
- (3) Reduce $\frac{1}{4}$ to its lowest terms.
- (4) Reduce $\frac{1}{5}$ to its lowest terms.
- (5) Reduce $\frac{1}{6}$ to its lowest terms.
- (6) Reduce $\frac{1}{7}$ to its lowest terms.

CASE 3.—To reduce a mixt number (which is composed of a whole number and a fraction thus, $7\frac{1}{4}$) to an improper fraction.

Rule.

1st.—Multiply the whole number into the denominator of the fraction.

2dly.—To the product add the numerator for a new numerator.

3dly.—Let its denominator be the denominator given.

Note. To express a whole number fraction-wise, put one for its denominator.

- (1) Reduce $12\frac{1}{4}$ to an improper fraction.
- (2) Reduce $19\frac{1}{4}$ to an improper fraction.
- (3) Reduce $16\frac{1}{2}$ to an improper fraction.
- (4) Reduce $12\frac{1}{2}$ to an improper fraction.
- (5) Reduce $100\frac{1}{2}$ to an improper fraction.
- (6) Reduce $79\frac{1}{2}$ to an improper fraction.

CASE 4.—To reduce an improper fraction to its proper terms,

Rule.

Divide the upper term by the lower.

- (1) Reduce $\frac{19}{4}$ to its proper terms.
- (2) Reduce $\frac{77}{4}$ to its proper terms.
- (3) Reduce $\frac{126}{4}$ to its proper terms.
- (4) Reduce $\frac{93}{4}$ to its proper terms.
- (5) Reduce $\frac{17}{2}$ to its proper terms.
- (6) Reduce $\frac{37}{2}$ to its proper terms.

CASE 5.—To reduce a compound fraction to a single one.

Rule.

Multiply all the numerators for a new numerator, and multiply all the denominators for a new denominator.

- (1) Reduce $\frac{1}{2}$ of $\frac{2}{3}$ of $\frac{3}{4}$ to a single fraction.
- (2) Reduce $\frac{1}{8}$ of $\frac{2}{3}$ of $\frac{3}{4}$ to a single fraction.
- (3) Reduce $\frac{1}{4}$ of $\frac{2}{3}$ of $\frac{1}{2}$ to a single fraction.
- (4) Reduce $\frac{1}{2}$ of $\frac{2}{3}$ of $\frac{3}{4}$ to a single fraction.
- (5) Reduce $\frac{2}{3}$ of $\frac{3}{4}$ of $\frac{4}{5}$ to a single fraction.
- (6) Reduce $\frac{1}{2}$ of $\frac{2}{3}$ of $\frac{3}{4}$ to a single fraction.

CASE 6.—To reduce vulgar fractions of one denomination, to another of the same value, having the numerator of the required fraction given.

Rule.

As the numerator of the given fraction is to its

denominator; so is the numerator of the intended fraction to its denominator.

(1) Reduce $\frac{3}{4}$ to a fraction of the same value, whose numerator shall be 15.

(2) Reduce $\frac{7}{8}$ to a fraction of the same value, whose numerator shall be 42.

(3) Reduce $\frac{3}{4}$ to a fraction of the same value, whose numerator shall be 34.

(4) Reduce $\frac{5}{8}$ to a fraction of the same value, whose numerator shall be 73.

(5) Reduce $\frac{9}{11}$ to a fraction of the same value, whose numerator shall be 96.

(6) Reduce $\frac{11}{10}$ to a fraction of the same value, whose numerator shall be 146.

CASE 7.—To reduce vulgar fractions from one denomination, to another of the same value, having the denominator of the required fraction given.

Rule.

As the denominator of the given fraction is to its numerator; so is the denominator of the intended fraction to its numerator.

(1) Reduce $\frac{3}{4}$ to a fraction of the same value, whose denominator shall be 20.

(2) Reduce $\frac{7}{8}$ to a fraction of the same value, whose denominator shall be 49.

(3) Reduce $\frac{3}{4}$ to a fraction of the same value, whose denominator shall be 46.

(4) Reduce $\frac{5}{8}$ to a fraction of the same value, whose denominator shall be 131 $\frac{1}{2}$.

(5) Reduce $\frac{9}{11}$ to a fraction of the same value, whose denominator shall be 144.

(6) Reduce $\frac{11}{10}$ to a fraction of the same value, whose denominator shall be 262 $\frac{1}{5}$.

CASE 8.—To reduce a mixt fraction to a single one, when the numerator is the integral part.

Rule.

First multiply it by the denominator of the frac-

tional part, and to that product add the numerator of the fractional part for a new numerator, then multiply the denominator of the fraction by the denominator of the fractional part for a new denominator: but when the denominator is the integral part, multiply it by the denominator of the fractional part, and to that product add the numerator of the fractional part, for a new denominator, then multiply the numerator of the fraction by the denominator of the fractional part for a new numerator.

(1) Reduce $4\frac{2}{3}$ to a simple fraction.

(2) Reduce $4\frac{1}{2}$ to a simple fraction.

(3) Reduce $4\frac{1}{3}$ to a simple fraction.

(4) Reduce $4\frac{1}{4}$ to a simple fraction.

(5) Reduce $4\frac{1}{5}$ to a simple fraction.

(6) Reduce $4\frac{1}{6}$ to a simple fraction.

Case 9.—To reduce the fraction of one denomination to the fraction of another; but greater, retaining the same value.

Rule.

1st. Reduce the given fraction to a compound fraction, by comparing it with all the denominations between it, and that denomination you would reduce it to.

2dly. Reduce that compound fraction to a single one, by case the fifth.

(1) Reduce $\frac{1}{2}$ of an anna, to the fraction of a rupee.

(2) Reduce $\frac{1}{2}$ of a pice, to the fraction of a rupee.

(3) Reduce $\frac{1}{2}$ of a chahtack, to the fraction of a seer.

(4) Reduce $\frac{1}{2}$ of a seer, to the fraction of a maund.

(5) Reduce $\frac{1}{2}$ of a pint of wine to the fraction of a hogshhead.

(6) Reduce $\frac{1}{2}$ of an inch to the fraction of a cubit.

CASE 10.—To reduce the fraction of one denomination to the fraction of another denomination, but less, retaining the same value.

Rule.

Multiply the given numerator by the parts of the denominations between it, and that denomination you would reduce the fraction to, for a new numerator, and place it over the given denominator.

(1) Reduce $\frac{1}{12}$ of a rupee, to the fraction of an anna.

(2) Reduce $\frac{1}{12}$ of a rupee, to the fraction of a pice.

(3) Reduce $\frac{1}{12}$ of a seer, to the fraction of a chahtack.

(4) Reduce $\frac{1}{12}$ of a maund, to the fraction of a seer.

(5) Reduce $\frac{1}{12}$ of a hogshead of wine, to the fraction of a pint.

(6) Reduce $\frac{1}{12}$ of a cubit, to the fraction of an inch.

CASE 11.—To find the proper quantity of a fraction in the known parts of an integer.

Rule:

Multiply the numerator by the common parts of the integer, and divide by the denominator.

(1) Reduce $\frac{1}{2}$ of a current rupee to its proper quantity.

(2) Reduce $\frac{1}{12}$ of an anna to its proper quantity.

(3) Reduce $\frac{1}{2}$ of 50rs. 9as. to its proper quantity.

(4) Reduce $\frac{1}{12}$ of a maund to its proper quantity.

(5) Reduce $\frac{1}{2}$ of 100mds. 29srs. to its proper quantity.

(6) What is the proper quantity of $\frac{1}{2}$ of a cubit?

(7) What is the proper quantity of $\frac{1}{2}$ of 18yds. 1cub. 10in?

(8) Reduce $\frac{1}{2}$ of a shilling to its proper quantity.

(9) Reduce $\frac{1}{2}$ of £5 9s. to its proper quantity.

(10) Reduce $\frac{1}{2}$ of a pound troy to its proper quantity.

(11) Reduce $\frac{1}{2}$ of a ton to its proper quantity.

(12) Reduce $\frac{1}{2}$ of a pound Avoirdupois to its proper quantity.

(13) Reduce $\frac{1}{2}$ of a mile to its proper quantity.

(14) Reduce $\frac{1}{2}$ of a yard to its proper quantity.

(15) Reduce $\frac{1}{2}$ of an ell English to its proper quantity.

(16) Reduce $\frac{1}{2}$ of a biggah to its proper quantity.

(17) Reduce $\frac{1}{2}$ of a tun of wine to its proper quantity.

(18) Reduce $\frac{1}{2}$ of a day to its proper quantity.

(19) Reduce $\frac{1}{2}$ of a month to its proper quantity.

(20) Reduce $\frac{2}{3}$ of a yard of cloth to its proper quantity.

CASE 12.—To reduce any given quantity to the fraction of any greater denomination of the same kind

Rule.

1st. Reduce the given quantity to the lowest mentioned term for a numerator.

2dly Reduce the integral parts to the same term for a denominator, and that will be the fraction required.

Note. If there be a fraction given with the said quantity, let it be put to the numerator of the fraction required.

(1) Reduce 10as. Sp. to the fraction of a current rupee.

(2) Reduce 5p. $\frac{1}{2}$ to the fraction of an anna.

(3) What part of 50rs. 9as. is 43rs. 5as. 5p. $\frac{1}{2}$?

(4) Reduce 6sis. 2cks. $\frac{1}{2}$ to the fraction of a maund.

(5) What part of 100mds. 29srs. is 55mds. 38srs. 5cks. $\frac{1}{2}$?

(6) Reduce 15in. $\frac{1}{2}$ to the fraction of a cubit.

(7) What part of 18yds. 1cub. 10in. is 6 yards 0 cub. 9in.?

(8) Reduce 5d. $\frac{2}{3}$ to the fraction of a shilling.

(9) What part of £.5 9s. is £.4 13s. 5d. $\frac{1}{2}$?

(10) Reduce 9oz. Troy to the fraction of a lb.

(11) Reduce 3cwt. 0qrs. 8lbs. 9oz. 13dms. $\frac{1}{2}$ to the fraction of a ton.

(12) Reduce 8oz. 14dms. $\frac{2}{3}$ to the fraction of a lb. Avoirdupois.

(13) Reduce 4fur. 125yds. 2ft. 1in. 2b.c. $\frac{1}{2}$ to the fraction of a mile?

(14) Reduce 2ft. 8in. 1b.c. $\frac{1}{2}$ to the fraction of a yard.

(15) Reduce 1 yard to the fraction of an ell.

(16) Reduce 17cot. 8cks. to the fraction of a biggah.

(17) Reduce 1hhd. 49galls. of wine to the fraction of a tun.

(18) Reduce 12hrs. 55min. 23sec. $\frac{1}{2}$ to the fraction of a day natural.

(19) Reduce 3wks. 1d. 9hrs. 36min. to the fraction of a month.

(20) Reduce 3qrs. 2nls. to the fraction of a yard.

ADDITION OF VULGAR FRACTIONS.

CASE 1.—To add vulgar fractions, when they are composed of mixed numbers, or compound fractions.

Rule.

1st. Reduce the mixed number to an improper fraction, and a compound fraction to a single fraction.

2dly. Reduce those fractions to a common denominator; then add all the numerators together for a new numerator, under which subscribe the common denominator.

Prove these sums by subtraction.

- (1) Add $\frac{1}{2}$ and $\frac{7}{8}$ together.
- (2) Add $\frac{1}{10}$, $\frac{1}{12}$ and $\frac{1}{3}$ together.
- (3) Add 19, and $7\frac{1}{2}$ of $\frac{1}{3}$ together.
- (4) Add $\frac{1}{2}$ of $\frac{7}{8}$, and $\frac{2}{3}$ of $\frac{1}{2}$ together.
- (5) Add $\frac{1}{4}$ of 95, and $\frac{7}{8}$ of 14 together.
- (6) Add $\frac{2}{3}$ and $17\frac{1}{2}$ together.
- (7) Add $12\frac{1}{2}$ and $3\frac{1}{2}$ and $4\frac{1}{4}$ together.
- (8) Add $6\frac{7}{8}$ of $\frac{1}{10}$ and $\frac{1}{2}$ of $\frac{1}{2}$ and $7\frac{1}{2}$ together.

CASE 2 — When the fractions are composed of different denominations.

Rule.

Reduce them to their proper quantities by Case the 11th in reduction, then add them as in addition of whole numbers.

- (1) Add $\frac{1}{3}$ of a rupee to $\frac{1}{4}$ of an anna.
- (2) Add $\frac{1}{3}$ of an anna to $\frac{1}{4}$ of a rupee.
- (3) Add $\frac{1}{2}$ of a maund to $\frac{1}{2}$ of a seer.
- (4) Add $\frac{1}{4}$ of a ton to $\frac{1}{10}$ of an cwt.
- (5) Add $\frac{3}{4}$ of a mile to $\frac{1}{10}$ of a furlong.
- (6) Add $\frac{1}{2}$ of a yard to $\frac{1}{3}$ of a foot.
- (7) Add $\frac{1}{3}$ of a day to $\frac{1}{4}$ of an hour.
- (8) Add $\frac{1}{4}$ of a cottah to $\frac{1}{5}$ of a biggah.
- (9) Add $\frac{1}{3}$ of a week, $\frac{1}{4}$ of a day, and $\frac{1}{2}$ of an hour together.
- (10) Add $\frac{1}{3}$ of a yard, $\frac{1}{4}$ of a foot, and $\frac{1}{5}$ of a mile together.
- (11) Add $\frac{1}{4}$ of a pound to $\frac{1}{5}$ of a shilling.
- (12) Add $\frac{1}{4}$ of an anna, to $\frac{1}{5}$ of a gold mohur.
- (13) Add $\frac{1}{4}$ of a maund to $\frac{1}{10}$ of a seer.
- (14) Add $\frac{1}{2}$ of a yard, to $\frac{1}{3}$ of a cubit.

SUBTRACTION OF VULGAR FRACTIONS.

CASE 1.—To subtract vulgar fractions, when composed of mixed numbers or compound fractions

Rule.

First, prepare them as directed in Addition, until reduced to a common denominator, then subtract the less number from the greater, and place that difference over the common denominator; but when the lower fraction is greater than the upper, subtract the numerator of the lower fraction from the denominator, and to that difference add the upper numerator, carrying one to the units place of the whole number.

- (1) From $11\frac{1}{2}$ take $\frac{3}{4}$.
- (2) From $2\frac{1}{2}$ take $\frac{1}{2}$.
- (3) From $96\frac{1}{2}$ take $14\frac{1}{2}$.
- (4) From 96 take $\frac{1}{2}$.
- (5) From $\frac{1}{3}$ of 76 take $\frac{1}{4}$ of 21.
- (6) From $12\frac{1}{2}$ take $\frac{1}{2}$ of $\frac{1}{2}$ of $\frac{1}{2}$.
- (7) From $71\frac{1}{2}$ take $1\frac{1}{2}$.
- (8) From $14\frac{1}{2}$ take $\frac{1}{2}$ of 19.

CASE 2—When the fractions are composed of different denominations.

Rule.

Reduce them to their proper quantities by Case the 11th in Reduction, then subtract them as in Subtraction of whole numbers.

- (1) From $1\frac{1}{2}$ of a rupee, take $\frac{1}{2}$ of an anna.
- (2) From $\frac{1}{2}$ of a gold mohur, take $\frac{1}{2}$ of an anna.
- (3) From $\frac{1}{2}$ of a maund, take $\frac{1}{2}$ of a seer.
- (4) From $\frac{1}{2}$ of an cwt take $\frac{1}{2}$ of a pound.
- (5) From $\frac{1}{2}$ of a league, take $\frac{1}{2}$ of a mile.
- (6) From 1 ell, take $\frac{1}{2}$ of a quarter.
- (7) From $\frac{1}{2}$ of a pipe of wine, take a gallon.
- (8) From $\frac{1}{2}$ of a biggah, take $\frac{1}{2}$ of a cottah.
- (9) From 7 weeks take 9 days $\frac{1}{2}$.
- (10) From 4 days $7\frac{1}{2}$ hours, take 1 day 9 hours $\frac{1}{2}$.
- (11) From $\frac{1}{2}$ of a rupee, take $\frac{1}{2}$ of an anna.
- (12) From $\frac{1}{2}$ of 20 rupees, take the $\frac{1}{2}$ of 2rs. 8as.
- (13) From $\frac{1}{2}$ of 5 maunds, take $\frac{1}{2}$ of 2 seers.
- (14) From $\frac{1}{2}$ of a yard, take $\frac{1}{2}$ of cubit.

MULTIPLICATION OF VULGAR FRACTIONS.

Rule.

Reduce compound fractions to simple fractions, and mixt numbers to improper fractions; then multiply all the numerators together for a new numerator, and all the denominators together for a new denominator; which products give the answer.

Note. When any number, either whole, or mixed, is multiplied by a fraction, the product is always less than the multiplicand, in the same proportion as the multiplying fraction is less than 1, or an unit.

- (1) Multiply $\frac{1}{2}$ by $\frac{1}{3}$.
- (2) Multiply $\frac{1}{4}$ by $\frac{1}{5}$.
- (3) Multiply $\frac{1}{2}$ of $\frac{1}{3}$ by $\frac{1}{4}$ of $\frac{1}{5}$.
- (4) Multiply $7\frac{1}{2}$ by $8\frac{1}{2}$.
- (5) Multiply $4\frac{1}{2}$ by $\frac{1}{3}$.
- (6) Multiply $\frac{1}{2}$ by $13\frac{1}{2}$.
- (7) Multiply $\frac{1}{2}$ of 7 by $\frac{1}{3}$.
- (8) Multiply $\frac{1}{2}$ of 8 by $\frac{1}{3}$ of 5.
- (9) Multiply $\frac{1}{2}$ by $\frac{1}{3}$ of 11.
- (10) Multiply $\frac{1}{2}$ of 91 by $71\frac{1}{2}$.
- (11) Multiply $12\frac{1}{2}$ by $\frac{1}{3}$ of 7.
- (12) Multiply $7\frac{1}{2}$ by $9\frac{1}{2}$.

DIVISION OF VULGAR FRACTIONS.

Rule.

Prepare the fractions as in Multiplication; then multiply the numerator of the divisor into the denominator of the dividend for a denominator, and the denominator of the divisor into the numerator of the dividend for a numerator; or which is the same, invert the terms of the divisor, then multiply the upper terms together, and the lower terms together (as in Multiplication) for the answer.

Note. When the dividend is greater than the divisor, the quotient will be greater than the dividend; but, when the dividend is less than the divisor, then the quotient will be less than the dividend, and in the same proportion as an unit is greater, or less than the dividing fraction.

- (1) Divide $\frac{11}{12}$ by $\frac{1}{2}$.
- (2) Divide $\frac{1}{12}$ by $\frac{1}{2}$.
- (3) Divide $\frac{1}{12}$ by $\frac{1}{10}$.
- (4) Divide $1\frac{1}{2}$ by $4\frac{1}{10}$.
- (5) Divide $\frac{1}{2}$ by 4 .
- (6) Divide 4 by $\frac{7}{8}$.
- (7) Divide 99 by 108.
- (8) Divide $\frac{1}{2}$ of 19 by $\frac{1}{2}$ of $\frac{1}{2}$.
- (9) Divide $\frac{2}{3}$ of $\frac{1}{2}$ by $\frac{2}{3}$ of $\frac{2}{3}$.
- (10) Divide $\frac{2}{3}$ of $\frac{1}{2}$ by $\frac{1}{2}$ of $\frac{1}{2}$.
- (11) Divide $4\frac{1}{2}$ by $\frac{1}{2}$ of 4 .
- (12) Divide $\frac{1}{2}$ of 4 by $4\frac{1}{2}$.

OF THE SINGLE RULE OF THREE IN VULGAR FRACTIONS.

Rule.

Having stated the terms according to the rule laid down in whole numbers, and reduced each term (if necessary) to a single or improper fraction, invert the first term, then multiply the three numerators together, and the three denominators together for the numerator and denominator of the answer, (which is the same as multiplying the second and third terms together, and dividing the product by the first) the answer will then be of the same denomination as the second term, which reduce to its proper quantity, if required.

(1) If $\frac{1}{12}$ of a seer of sugar cost $\frac{1}{2}$ of a rupee, what cost $\frac{1}{12}$ seer?

(2) If $\frac{1}{2}$ of an ell cost $\frac{1}{2}$ of a rupee, what cost $\frac{1}{4}$ of an ell.

(3) If $\frac{1}{2}$ of a cubit cost $\frac{1}{4}$ of a rupee, what cost 1 cubit?

(4) If $3\frac{1}{2}$ yards of cloth, that is $1\frac{1}{2}$ yard wide, be sufficient to make a cloak, how much must I have of that sort, which is $\frac{1}{2}$ of a yard wide, to make a cloak of the same bigness?

(5) If 3oz. of silver cost 16rs. 5as. what cost $\frac{1}{2}$ of an ounce?

(6) If $6\frac{1}{2}$ yards cost 18 rupees, what cost $9\frac{1}{2}$ yards?

(7) If a dollar be worth 33 $\frac{1}{2}$ annas, what are 500 dollars worth?

(8) If 16 men finish a piece of work in 28 $\frac{1}{2}$ days, how long will 12 men require to do the same work?

(9) If $1\frac{1}{2}$ cubits cost 9 annas, what cost $16\frac{1}{2}$ cubits?

(10) If 1 pagoda be worth 3 $\frac{1}{2}$ sa.rs. what are 100 pagodas worth?

(11) If $\frac{1}{2}$ of a seer cost $\frac{1}{4}$ of a rupee, what cost 1 seer?

(12) If $1\frac{1}{2}$ yards in breadth require $20\frac{1}{2}$ yards long to make a garment, what length will $\frac{3}{4}$ of a yard wide require to make the same?

(13) If a mug of silver weigh 46 $\frac{1}{2}$ srs. what is its worth at 1 $\frac{1}{2}$ r. per seer?

(14) If $\frac{1}{2}$ of a maund cost 14rs. 1as. what will $7\frac{1}{2}$ maunds cost?

(15) If $\frac{1}{2}$ of a cubit cost $\frac{1}{4}$ of 19 annas, what cost 7 cubits?

(16) How many pieces of merchandize at $20\frac{1}{2}$ rupees per piece, are to be given for 240 pieces at $12\frac{1}{2}$ rupees per piece?

(17) If 8 chahtacks of isinglass cost 4as. 9p. $\frac{1}{2}$ what cost 1 chahtack?

(18) If 1 yard of broad cloth cost $15\frac{1}{2}$ rupees, what will 4 pieces, each containing 27 yards $\frac{1}{2}$, cost?

(19) A mercer bought $3\frac{1}{2}$ pieces of silk, each containing $24\frac{1}{2}$ cubits, at 6 annas per cubit, I demand the value of the $3\frac{1}{2}$ pieces at that rate?

(20) How many yards of canvas that is $1\frac{1}{2}$ wide, will be sufficient to line 20 yards of say, that is $\frac{1}{2}$ of a yard wide?

(21) A merchant had $5\frac{1}{2}$ maunds of sugar at $6\frac{1}{2}$ rupees per maund, which he bartered for tea at $3\frac{1}{2}$ rupees per seer. I demand how much tea must be given for the sugar?

(22) Bought 120 seers of tea at $3\frac{1}{2}$ rupees per seer, and sold it for 470 rupees, what was the gain or loss per cent?

(23) If when the days are $13\frac{1}{2}$ hours long, a traveller performs his journey in $35\frac{1}{2}$ days, in how many days will he perform the same journey, when the days are $11\frac{1}{2}$ hours long?

(24) How much in length that is $1\frac{1}{2}$ poles broad, will make a square acre?

Note. Prepare the fractions, in inverse proportion, as in the former rules, and invert the third term of the proportion: then multiply the three terms continually together, and the product will be the answer.

THE DOUBLE RULE OF THREE IN VULGAR FRACTIONS.

Rule.

Proceed according to the rule laid down in whole numbers for stating the question, and prepare the terms, as directed in the Single Rule of Three in Vulgar Fractions.

(1) If 9 people spend $100\frac{1}{2}$ rupees in 18 days, how much will 20 people spend in 30 days at the same rate?

(2) Three men having worked $19\frac{1}{2}$ days, received $8\frac{1}{2}$ rupees, how much must 20 men have for 100 days and a quarter?

(3) A man and his wife having laboured 1 day, earned $4\frac{1}{2}$ rupees, I demand how much they must

have for $10\frac{1}{2}$ days, when their two sons helped them?

(4) A man with his family, which in all were 15 persons did usually expend $7\frac{1}{2}$ maunds of rice in a week, how much will be expended in $22\frac{1}{2}$ weeks, when 7 persons leave the family?

(5) Seven men with their wives upon examining into their expences for 20 weeks past, found that they had laid out $40\frac{1}{2}$ rupees. I demand in what time $28\frac{1}{2}$ rupees may be spent by 46 men in the like proportion?

(6) Three sailors having been abroad $9\frac{1}{2}$ months received $40\frac{1}{2}$ rupees. I demand how much 100 sailors must receive for 28 months service?

DECIMAL FRACTIONS.

NOTATION.

THE word decimal is derived from decem (ten) and denotes the nature of its numbers; because the integer, or whole thing, whether it be coin, weight, measure, time, &c. is supposed to be divided into ten equal parts, and every one of these parts, into ten other equal parts, &c. *ad infinitum*.

The integer being thus divided by imagination into 10, 100, 1000, 10,000, &c. is the denominator to the decimal fraction.

Thus $\frac{1}{10}$, $\frac{1}{100}$, $\frac{1}{1000}$, $\frac{1}{10000}$, &c.

These denominators are seldom or never set down, but only the numerators, and when the numerators do not consist of so many places, as the denominator has cyphers, the said place in the numerator must be supplied by cyphers prefixed on the left hand: So $\frac{1}{10}$ is wrote .3, $\frac{1}{100}$ is .05, $\frac{1}{1000}$ is .017, and $\frac{1}{10000}$ is .0051, &c.

Also mixed numbers are expressed thus, viz. $8\frac{7}{10}$

is 8 and 7 tenths, 59.017 is 59 and 17 thousandths, or parts of a thousand: cyphers at the right hand of a decimal do neither augment or diminish its value; for .5, .50, .500, .5000, and .50000 are decimals having the same value, being each equal to $\frac{1}{2}$, as may be found by abbreviation of Vulgar Fractions. Cyphers prefixed to decimals decrease their value in a tenfold proportion by removing them further from the integer.

thus, $\left\{ \begin{array}{l} .5 = \text{tenth parts,} \\ .05 = \text{parts of an hundred,} \\ .005 = \text{parts of a thousand,} \\ .0005 = \text{parts of ten thousand,} \\ .00005 = \text{parts of an hundred thousand, \&c.} \end{array} \right.$

In whole numbers the first place above (that is on the left hand of) the place of units, signifies tens or units; but in fractions the first place beneath (that is on the right hand of) the place of units, denotes tenth parts of 1, or unity, and is called the first place of decimal parts, or place of primes; likewise the second place above the place of units signifies hundreds of units, but the second place beneath the place of units expresses hundredth parts of unity, and is called the second place of decimals, or place of seconds; and that as the value of the places in integers ascend in a tenfold proportion from the place of units towards the left hand, so the value of the places of decimals descend in a tenfold proportion beneath the place of units towards the right hand.

A Table for Notation of Integers and Decimals:

8 7 2 3 6 5.

Units place.
Tens.
Hundreds.
Thousands.
Tens of thousands.
Hundreds of thousands.

8 2 3 5 3 7 8 5

Part of an hundred Million.
Parts of ten Million.
Parts of a Million.
Parts of an hundred thousand.
Parts of ten thousand.
Thousands parts.
Hundreds parts.
Tenths.

It may be observed by the foregoing table, that the places of integers or whole numbers are separated from the decimal parts by a point: that the numbers on the left hand of the point express 872365 integers or units, and that the numbers on the right hand of the point shews 82353785 parts of 1, (or an integer) supposed to be divided into 100,000,000 equal parts. Hence if the separating point in any mixed, or fractional number be moved one place towards the left hand, then every figure, and consequently the whole expression is but a tenth part of what it was before, that is, it is divided by 10: if it be moved two places, it is divided by 100: if three places by 1000, &c. but if the separating point be moved towards the right hand, then the whole expression is multiplied by 10, 100, 1000, &c. according as it is moved one, two, or three places. There are several ways of reading or expressing a decimal, as supposing the decimal parts in the table were to be read in words, viz. .82353785.

1st. They may be reduced to, and expressed as Vulgar Fractions.

$$\text{viz. } \frac{82353785}{100000000}$$

2dly. By calling them primes, seconds, &c. according to their distance from the separating point, viz. 8 primes, 2 seconds, 3 thirds, 5 fourths, 3 fifths, 7 sixths, 8 sevenths and 5 eighths.

3dly. Thus, 82 millions, 353 thousands, 785 eighths.

4thly. Or thus, 8, 2, 3, 5, 3, 7, 8, 5 of a decimal.

ADDITION OF DECIMALS.

When Decimal Fractions are to be added together, observe that the commas, or separating points in each expression, be placed directly underneath each other; for then primes, seconds, thirds, &c. will fall under those of the same name; and in mixed numbers, units will fall under units, tens under tens, &c.

Rule.

Add as in whole numbers, and from the sum or difference, cut off so many places for decimals, as are equal to the greatest number of decimals in any of the given numbers.

(1) Rupees.

14. 471

7. 191

1. 8126

3. 6126

7. 1281

18. 8126

47. 0279

(2) Annas.

47. 4

19. 71

461. 721

400. 004

7. 1004

7. 07

(3) Pies.

7004. 16

712. 712

19. 0174

7 3126

71. 1851

3. 108

(4) Maunds.

71. 001

130. 07

31. 121

12. 4101

94

7. 8

(5) Seers.

41. 8102

140. 037

18. 10

7. 8141

16. 4612

7. 81

(6) Chahtarks

861. 18104

3. 14

1. 181

7. 7121

8. 19817

13. 071

(7) Let $3746 + 137.5 + 1.347 + 375 + 1.85 + .0736285 + 87396.4 + 8.7386429 + 127 + 5.275$ be added together.

SUBTRACTION OF DECIMALS.

Rule.

Having first set down the greater of the two numbers given (whether it be a whole number, mixed number, or a decimal) set down the less under it, according to the directions given in Addition, then subtract as in whole numbers imagining all the vacant places filled with cyphers.

(1) From 924. 65
Take 78. 0045

(2) 80. 25908
7. 0795

(3) 375. 5 ——— 86. 47284

(4) 87. 569245 — 19. 87

(5) 1. ——— . 732594

(6) 684. ——— 9. 3275

(7) 1081. 761 ——— 10. 00012

(8) 761. 8109 ——— 18. 912

(9) Let 375. 5 be diminished, or made less by .97637387 and shew their difference.

MULTIPLICATION OF DECIMALS.

CASE 1.—When both factors are finite decimals, whether they be pure, or joined with integers.

Rule.

Multiply them as if they were all whole numbers, and from the product (towards the right hand) cut off so many places for decimal parts in the product, as there are in both the multiplier and multiplicand counted together. But if it so happens, that there are not so many places in the product, supply the defect by prefixing cyphers.

(1) Multiply .612 by 4.12

(2) Multiply .9746 by .0259

	Multiplicands.	Multipliers,
(3)	.48	× 48
(4)	37.9	× 46.5
(5)	.121	× 17.2
(6)	1.81	× 71.
(7)	4.1	× 1.42
(8)	.0071	× .121
(9)	.0041	× .00017
(10)	.0027	× 41.
(11)	410.	× .0012
(12)	.07	× .07
(13)	.1007	× .41
(14)	4.001	× .004

CASE 2.—Two Decimal Fractions being given to reserve in their product a number of places.

. Rule.

Set the units place of the multiplier directly underneath that figure of the decimal part of the multiplicand, whose place you would reserve in the product, and invert the order of all its other places, that is, write the decimals on the left hand, and the integers, if any, on the right.

Then in multiplying, always begin at that figure of the multiplicand, which stands over the figure of each particular product directly underneath one another, due regard being had to the increase, which would arise out of the two next figures to the right hand of that figure in the multiplicand, which you then begin with: carry one from 5 to 15, two from 15 to 25, three from 25 to 35, &c. and the sum of these lines will give the product.

(1) Let 73.8429753 be multiplied into 4.628754, reserving only 5 places of decimal parts in the product.

(2) Let 843.7527 be multiplied into 8634.875, reserving only the integers in the product.

(3) Multiply 384.672158 by 36.8845 so, as to have only four decimal places in the product.

(4) Multiply 3.141592 by 52.7438 so, as to have only four decimal places in the product.

DIVISION OF DECIMALS.

In any of the following cases in division, if the dividend be greater than the divisor, the quotient will be either a whole, or a mixt number; but when the dividend is less than the divisor, the quotient must necessarily be a fraction: for a less number is contained in a greater once at the least; but the greater is not contained once in the less.

CASE 1.—When the divisor, and dividend are both finite decimals.

Rule.

Divide as in whole numbers, and from the right hand of the quotient point off for decimals so many places as the decimal places in the dividend exceed those in the divisor, and those to the left if any, are integers; but if the places of the quotient are not so many, as this rule requires, supply the defect by prefixing cyphers to the quotient; but if the decimal places in the divisor are more than those in the dividend, annex cyphers to the dividend to make them equal, and the quotient will be integers until all those cyphers are used. Whenever you have a remainder, annex the sign + to the right of the quotient.

Divisors.		Dividends.
(1) 87.364	\div	714.025972
(2) .179	\div	.48624097
(3) 8.45	\div	295.75
(4) .7563	\div	59062.4922
(5) .0078	\div	4368.
(6) 24.3	\div	780.516

R

(7) .7875	÷ 441.
(8) 5.73	) 2.580219
(9) .534	) .30438
(10) 436.	) 34246.056
(11) 25.324	) 237.34691084
(12) .784	) .281456
(13) 7.84	) 28.1456.

CASE 2.—To contract the work of division, when the divisor consists of many decimal places.

Rule.

Having determined the value of the quotient figures, let each remainder be a new dividend, and for every such dividend point off one figure from the right hand of the divisor, observing at each multiplication to have regard to the increase of the figures so cut off, as in contracted multiplication.

Divisors.	Dividends.
(1) 384 . 672158)	14169 . 2066038510
(2) .67268479)	56 . 00000000
(3) . 9 . 365407)	87 . 076326

If any whole, mixed, or decimal number is given to be divided by 10, 100, 1000, &c. only remove the separating point towards the left hand so many places, as there are cyphers in the divisor; also in multiplication, the separating point is moved to the right hand so many places, as there are cyphers in the multiplier.

Multiplication.	Division.
.7865 × 10	10) 7865
.7865 × 100	100) 7865
.7865 × 1000	1000) 7865
.7865 × 10000	10000) 7865
.7865 × 100000	100000) 7865

REDUCTION OF DECIMALS.

CASE 1.—To reduce a vulgar fraction into a decimal.

Rule.

Annex cyphers to the numerator until it be equal to, or greater than the denominator, then divide by the denominator, and the quotient will be the decimal sought.

If after you have made use of all the cyphers annexed to the numerator, there be a remainder, annex cyphers thereto, and continue your division, until it divide off, or arrive, to what degree of exactness you think proper.

Always observe to set a point betwixt the numerator, and the cyphers annexed thereto, and that the quotient has as many places, as you annex cyphers to the numerator and remainders, and if it is deficient, let the want be supplied by prefixing as many cyphers to the quotient as it falls short.

(1) Reduce $\frac{1}{2}$ into a decimal.

Reduce $\frac{(2)}{2} \quad \frac{(3)}{4} \quad \frac{(4)}{8} \quad \frac{(5)}{16} \quad \frac{(6)}{32}$ into decimals.

Reduce $\frac{(7)}{5} \quad \frac{(8)}{25}$ and $\frac{(9)}{125}$ into decimals.

Those decimals, that are reduced from such a vulgar fraction, whose numerator with cyphers annexed, is an aliquot part of, or can be measured by its denominator, are finite, or terminate decimals, as the decimals resulting from the foregoing examples.

No fraction will produce a finite decimal, but such whose denominator is 2 or 5, and their examples.

But such as are produced from a vulgar fraction whose numerator with cyphers annexed is not an aliquot part of, or cannot be measured by its denominator, will be indeterminate, or endless.

In circulating decimals, if one figure only repeats, it is called a single repetend, as per example, which will be the same AD INFINITUM.

Suppose the decimal of $\frac{1}{2}, \frac{2}{3}, \frac{1}{4}, \frac{5}{6}, \frac{1}{7}, \frac{6}{7}, \frac{1}{8}$, &c. was required.

$$\begin{array}{r} 9 \overline{) 1.0000} \\ \underline{9} \\ 1111 \end{array}$$

$$.1111 \&c. = \frac{1}{9}$$

$$\begin{array}{r} 9 \overline{) 2.0000} \\ \underline{18} \\ 2222 \end{array}$$

$$.2222 \&c. = \frac{2}{9}$$

$$\begin{array}{r} 9 \overline{) 3.0000} \\ \underline{27} \\ 3333 \end{array}$$

$$.3333 \&c. = \frac{1}{3}$$

To avoid the trouble of writing down unnecessary figures, a single repetend is denoted by the repeating digit dashed, that is the decimal $.11111\&c. = 1 = \frac{1}{9}$, $.33333\&c. = 3 = \frac{3}{9}$, also $.33333\&c. = 3 = \frac{1}{3} = \frac{1}{3}$; $4 = \frac{4}{9}$, $5 = \frac{5}{9}$, $6 = \frac{6}{9} = \frac{2}{3}$, $7 = \frac{7}{9}$, $8 = \frac{8}{9}$ and $9 = 1$.

Suppose it was required to reduce $\frac{1}{12}$, $\frac{2}{30}$, and $\frac{3}{90}$ into decimals.

$$12)1.000 \quad 36)5000(.138 = \frac{1}{36} + 32 \text{ remr. ansr.}$$

$$.083 = \frac{2}{25} \text{ Ansr.}$$

$$960)31.000000(.0322916 = \frac{1}{30} + 640 \text{ remr. Ansr.}$$

The decimals resulting from these last examples are called mixed, single repetends, the last figure of which will repeat to AD INFINITUM.

Let $\frac{2}{11}$, $\frac{3}{7}$, and $\frac{17}{110}$ be reduced into decimals.

$$11)2.000000 \quad 7).0300000$$

$$.181818\&c. 18^{\circ} \text{Ansr.} \quad 428571 \text{ Ansr.}$$

$$286)17.000000(.0594405—170 \text{ remr. Ansr.}$$

Note. The repetends are here distinguished by a dot under them, instead of a dash or stroke drawn through them.

Those decimals in which two or more figures circulate, are called compound repetends, and the manner of distinguishing them is by dashing the first and last figure of the repetend, by which means we make one place of the repetend sufficient, as in the last example.

In a compound repetend, any one of the circulating figures may be made the first of the repetend; for instance, in the repetend $8.6325325325\&c.$ it may be made 8.63253 , or 8.632532 . By this means any two, or more repetends may be made to begin and end in the same place, and then, they are said to be conterminous.

Let $\frac{11}{11}$ be reduced to a decimal.

8731)13.0000000000 (.0034843205 + 2145 remainder answer.

The decimal resulting from the last example is called an approximate decimal, having some places true, and the rest uncertain; these approximating decimals are sometimes wrote with the signs + or — to denote whether the last figure is greater or less than just, thus, .0034843205 + or .0034843206 — the first signifies that the decimal is greater than .0034843205 + by some uncertain figure, and the second viz. .0034843206 — denotes that the true decimal exceeds .0034843205, and is less than .0034843206.

Reduce $\frac{1}{8}$ to a decimal.

26)5.0000000 (1923076 + 24 remainder answer.

Reduce $\frac{1}{11}$ to a decimal.

28)5.0000000 (.17857142 + 24 remainder answer.

Reduce $\frac{1}{11}$ of $\frac{1}{11}$ to a decimal.

$$11 \times 10 = 110$$

$$14 \times 13 = 182$$

182)110.0000000 (6043956 + 8 remainder, answer.

CASE 2.—To reduce a decimal into its least equivalent vulgar fraction.

1st. If the decimal be finite.

Rule.

Under the given decimal write an unit, with as many cyphers, as the decimal consists of places; then divide both the numerator, and the denominator by the greatest common measuring, which gives the least equivalent vulgar fraction required.

Required the least vulgar fraction equivalent to

$$\overset{(1)}{.5}, \quad \overset{(2)}{.25}, \quad \overset{(3)}{.75}, \quad \overset{(4)}{.125}, \quad \text{and} \quad \overset{(5)}{.0625}.$$

(6) What is the least vulgar fraction equal to .625?

(7) Let .5625 be reduced to its lowest, or least equivalent fraction.

CASE 3.—To reduce coins, weights, measures, &c. into decimals.

Rule.

Divide the lowest of the species given by as many of that, as make one of the next greatest: to that quotient annex the next given species, and divide by as many of that, as make one of the next greatest, and so on; to the last quotient annex the integer (if any) and you have the answer.

- (1) Reduce 7as. 6p. to the decimal of a rupee.
- (2) Reduce 10s. 9 $\frac{1}{4}$ d. to the decimal of a pound.
- (3) Reduce 24srs. to the decimal of a maund.
- (4) Reduce 14 chahtacks, to the decimal of a maund.
- (5) Reduce 4cwt. 2qrs. to the decimal of a ton.
- (6) Reduce 14srs. 8cks. to the decimal of a maund.
- (7) Reduce 174 drams to the decimal of an cwt.
- (8) Reduce 4 inches to the decimal of a cubit.
- (9) Reduce 76 yards to the decimal of a mile.
- (10) Reduce 1 mile to the decimal of a league.
- (11) Reduce 3qrs. 2nls. to the decimal of a yard.
- (12) Reduce 4 cottahs to the decimal of a biggah.
- (13) Reduce 1 pint to the decimal of a gallon.
- (14) Reduce 1 gallon of wine to the decimal of a hogshhead.
- (15) Reduce 7 minutes to the decimal of a day.
- (16) Reduce 2 days to the decimal of a week.
- (17) Reduce 72 days to the decimal of a year.

CASE 4.—To reduce any decimal into the equivalent known parts of coin, weight, measure.

Rule.

Multiply the given number by the number of units, contained in the next inferior denomination, cutting off as many figures from the product, as the

given decimal consists of, then multiply the remaining parts (if any) by the next lower denomination, cutting off as before, and thus proceed till you have converted your decimals, or come to the lowest part, and the several figures to the left hand of the separating points, will be the several parts of the quantity required.

(1) What is the proper quantity of .76 of a rupee?

(2) What is the proper quantity of .861 of a maund?

(3) What is the proper quantity of .461 of a shilling?

(4) What is the proper quantity of .761 of a hogshead of wine?

(5) What is the proper quantity of .17 of a ton of wine?

(6) What is the proper quantity of .761 of a day?

(7) What is the proper quantity of .7 of a pound troy of silver?

(8) What is the proper quantity of .71 of 4 chahtacks of gold?

(9) What is the proper quantity of .67 of a league?

(10) What is the proper quantity of .712 of a furlong?

(11) What is the proper quantity of .07 of a barrel of ale?

(12) What is the proper quantity of .4712 of an ell English?

(13) What is the proper quantity of .72 of a hogshead of beer?

(14) What is the proper quantity of .61 of a tun of wine?

(15) What is the proper quantity of .092 of 13 big. 2 cot.?

(16) What is the proper quantity of .461 of 29 seers of opium?

(17) What is the proper quantity of .712 of 13 annas?

(18) What is the proper quantity of .12 of a cubit?

(19) What is the proper quantity of .3 of a year?

(20) What is the proper quantity of .5 of an hour?

(21) A certain tenant hired an house for 9 months at 112.4 per month, how much was due at the end of the term?

ADDITION AND SUBTRACTION OF DECIMALS.

Rule.

Reduce the decimals to their proper quantity, then add or subtract as in whole numbers.

(1) What is the sum of .148 of a rupee and .196 of an anna reduced to their proper quantities?

(2) What is the sum of .17md. and .84sr.?

(3) What is the sum of .17 ton .19cwt. .17qrs. and 7lb.?

(4) What is the difference between .117 and .57 of a rupee?

(5) What is the difference between .41 of a day and .16 of an hour?

(6) What is the sum of .728 of a maund and .94 of a seer, reduced to their proper quantities?

(7) What is the sum of .74 of a yard and .84 of a cubit, reduced to their proper quantities?

(8) What is the difference between .18 of a rupee, and .9 of an anna, reduced to their former quantities?

(9) What is the difference between .98 of a maund and .24 of a seer reduced to their proper quantities?

(10) What is the difference between .174 of a yard and .86 of a cubit, reduced to their proper quantities?

THE SINGLE RULE OF THREE, IN DECIMALS.

Observe the same rule for stating and working the terms as before directed. Let the first and third terms be reduced either to the decimal parts of the integer or the decimals of one denomination as will appear most convenient, and let the second term be reduced to the same denomination as required in the answer, then will the fourth term be the answer sought.

(1) If 1.4 seer of sago cost 14.5 annas, what cost 1md. 35.31srs.?

(2) If 1.47 maund of sugar be worth 7.5 rupees, what is 1.7 seer worth at that rate?

(3) If 8.4 seers of opium cost 1r. 6as. 4.8p. what cost .3 bales each 4mds. 2srs. 7.4chs.?

(4) If 1.6cwt. of sugar cost £ 3. 12.76s. what cost 3 hogsheads, each 11cwt. 3qrs. 10.12lbs?

(5) If 1.5 ounces of silver be worth 7.5 rupees, what is 9.7 pounds worth at that rate?

(6) If 1 bottle of wine cost 1.2 rupees, what cost 12.5 hogsheads, supposing each bottle to hold exactly a quart?

(7) If 1 yard of cloth cost 12.3 rupees, what cost 3 bales each 21.5 yds?

(8) A man bought a piece of cloth for 30rs. 8as. 6p. I demand how many cubits there were in the same, when he gave after the rate of 11as. 2.6p. per cubit?

(9) A man bought 5.8 maunds of oil for 60.4 rupees; but by misfortune he chanced to lose 50.9srs. I demand, how he must sell the rest per seer, to be no loser?

(10) Two men bartered, A. had 40.7 yards of linen, for which B. gave him 25.6 cubits of muslin at 4.5 rupees per cubit. I demand the price of the linen per yard?

(11) A man bought 7.6 maunds of sugar, at 16.1

per maund^l and sold the same at 6.5 per seer. I demand, whether he gained or lost, and how much?

(12) A shrub-vender, made a quantity of mangoe shrub, which cost him in making 900.4 rupees, afterwards sold it in casks at 26.7 rupees, by which he gained 300 rupees. I demand the quantity that was brewed, when each cask contained 20 gallons?

(13) A person bought 3mds. 1.5srs. of cloves at the rate of 2.75 rupees per seer, and sold them for 300 rupees: what did he gain or lose by the bargain?

(14) A merchant bought 436 cubits of cloth, for 8.5 annas per cubit, and sold it again for 10.75 annas per cubit: what did he gain by the sale thereof?

(15) A. owes B. 2960.85 rupees; but he compounds for 7.5 annas in the rupee: what must B. receive of his debt?

(16) Bought 3 cases of opium, each weighing 4 mds. 21.9srs. at 6 rupees per maund, which he sold out at 7.165 rupees per maund: what did he gain by the whole?

(17) Supposing a tankard weighing 1lb. 10oz. 10dwts. 4gr. cost £.6 3s. 9½d. what is that per oz.?

(18) If 3lb. cost £.1 1s. 8d. what will £.10 11s. 3d. buy?

DUODECIMALS,

ARE fractions of a foot, an inch, or any part of an inch, having 12 for their denominator.

NOTATION OF DUODECIMALS.

Duodecimals are written thus:

Ft.	In.	~	~	~
3	7	2	3	7

and are read thus: 3 feet, 7 inches, 2 seconds, 3 thirds, 7 fourths, &c.

ADDITION OF DUODECIMALS.

12 fourths make 1 third.
 12 thirds.....1 second
 12 seconds.....1 inch.
 12 inches1 foot.

(1)	Ft.	In.	"	"	"
	14	4	3	5	6
	17	10	11	10	4
	16	3	7	5	8
	19	1	10	11	11
	19	3	5	7	11
	46	4	9	10	6

(2)	Ft.	In.	"	"	"
	28	4	3	7	10
	36	10	3	11	5
	19	10	4	7	6
	39	5	6	9	4
	47	6	2	10	11
	92	11	10	3	7

(3) A joiner having finished several very curious pieces of workmanship, would know the contents of the whole: now the first piece measured 17 feet, 10 inches, 2 seconds, and 1 third. The second measured 20 feet, 4 inches, and 7 thirds. The third 49 feet, 6 inches, and 9 seconds. The fourth four-score feet, and 10 seconds. The fifth 17 feet, and 4 thirds. The sixth, threescore feet, and 10 seconds, and the seventh 37 feet, and 9 thirds: what was the content in square measure?

SUBTRACTION OF DUODECIMALS.

(1)	Ft.	In.	"	"	"
From	74	3	4	7	6
Take	19	4	8	8	10

(2)	Ft.	In.	"	"	"
	1000	5	7	3	1
	907	8	9	10	11

(3) A joiner having lined several rooms very curiously with cedar, finds the amount to be in square measure 800 feet, 3 inches, 4"; but several deductions being to be made for windows, arches, &c. those deductions amounted to 70ft. 3in. 7" 10" 5" how many feet of workmanship must he be paid for?

CROSS MULTIPLICATION.

Rule.

FEET multiplied by feet give feet,
 Feet multiplied by inches give inches,
 Feet multiplied by seconds give seconds,
 Inches multiplied by inches give seconds,
 Inches multiplied by seconds give thirds,
 Seconds multiplied by seconds give fourths, &c.

The truth of any of these operations may be proved by reducing their factors into inches, and dividing their product by 144, the number of square inches in a foot square, the quotient will be the answer. They may also be wrought by Vulgar Fractions and Decimals. And when the number of feet happens to be large in either or both of the factors, instead of multiplying by inches, if there are any, you may take parts with them.

(1) Multiply 7ft. 3in. by 4ft. 7in.

	Ft.	In.	"	"	"	Ft.	In.	"	"	"
(2)	7	5	—	×		3	9	—	—	—
(3)	4	6	—	×		5	8	—	—	—
(4)	9	7	—	×		9	7	—	—	—
(5)	7	10	—	×		8	11	—	—	—
(6)	3	11	—	×		9	5	—	—	—
(7)	7	3	2	×		1	7	3	—	—
(8)	8	6	9	×		7	3	8	—	—
(9)	3	10	6	×		7	4	8	—	—
(10)	5	6	7	×		8	9	10	—	—
(11)	76	7	—	×		48	9	—	—	—
(12)	767	5	—	×		198	3	—	—	—
(13)	49	3	1	×		48	1	2	—	—
(14)	76	3	9	×		84	7	11	—	—
(15)	487	11	10	×		186	10	11	—	—

DIVISION OF DUODECIMALS.

Rule.

For any divisor less than 12, or their multiples perform the operation as in Compound Division ; but when both factors consist of several denominations, the plainest way, though not the shortest, is to reduce them to their lowest parts, and divide as in whole numbers.

$$(1) \begin{array}{r} \text{Ft.} \quad \text{In.} \quad " \quad " \quad " \\ 8 \overline{) 712} \quad 8 \quad 4 \quad 3 \quad 7 \end{array} \quad (2) \begin{array}{r} \text{Ft.} \quad \text{In.} \quad " \quad " \quad " \\ 9 \overline{) 972} \quad 0 \quad 4 \quad 2 \quad 7 \end{array}$$

	Ft.	In.	"		Ft.	In.	"	"	"
(3)	30	0	—	)	810	9	7	—	—
(4)	48	9	—	)	3733	5	3	—	—
(5)	1	7	3	)	11	7	9	11	6
(6)	12	3	10	)	119	8	2	10	10

ALLIGATION.

ALLIGATION is when corn, wine, spices, metals, &c. are required to be mixed together, the method of proportioning such mixture is called the Rule of Alligation.

ALLIGATION MEDIAL.

Alligation Medial is when the quantities, and prices of several things are given to find the mean price of the mixtures compounded of those things.

Rule.

First find the sum of the quantities proposed to be mixed, and also the sum of their particular rates, then,

As the whole composition
Is to its total value ;
So is any part of the composition
To its mean price.

Alligation Medial is proved by finding the value of the whole mixture at the mean rate, and if it agrees with the total value of the several quantities at their respective rates, the work is right.

(1) A grocer mingled 12 maunds of sugar at 6 rupees per maund, 11 maunds at 4 rupees per maund, and 12 maunds at 5 rupees per maund together, I demand the price of three maunds of this mixture?

(2) A punch-wallah mixed three sorts of arrack together, viz. 12 gallons at 6 annas per gallon, 16 gallons at 7 annas per gallon, and 21 gallons at 9 annas per gallon; I demand what 1 gallon of this mixture is worth?

(3) A refiner having 5lb. of silver bullion of 8 ounces fine, 10lb. of 7 ounces fine, and 15lb. of 6 ounces fine, would melt all together: I demand what fineness 1lb. of this mass shall be?

(4) A mint master has 3lb. of gold of 22 carats fine, and 3lb. of 20 carats fine: I demand what fineness an ounce of this mixture will bear?

(5) An hostler mixing provender for his horses, would put in a quantity of beans at 5 rupees per maund with the like quantity of gram at 3rs. 6as. per maund: I demand the price of a maund of this mixture?

(6) A tea-vender hath several sorts of tea, viz. one sort at 4rs. 6as. another at 4 rupees, and another at 3rs. 6as. per seer, and he would mix an equal quantity of each of these together, I demand the price of a seer of this mixture?

(7) A merchant had several sorts of indigo, viz. one sort at 20 rupees per maund, another at 25 rupees, a third at 30 rupees, and a fourth at 35 rupees per maund, and he would mix an equal quantity of each together, I demand the price of a maund of this mixture?

(8) Having mixed three sorts of cotton together, viz. 20 maunds of a superior quality being at 15 rupees per maund, 50 maunds at 12 rupees per maund, and of the third quality I put in 30 maunds, which

sold for 9 rupees only per maund, I desire to know, what a maund of this mixture is now worth?

ALLIGATION ALTERNATE.

Alligation Alternate is when the particular rate of every ingredient, and the mean rate are given to discover the particular quantity of each ingredient concerned in a mixture.

Rule.

The rates being all of, or reduced to, one denomination, set the rates of the simples in a column under one another, and the mean rate in the centre on the left hand of these.

Then link together the several simple rates, so that one greater than the mean rate may be coupled to another which is less: when one branch is linked to two or more other branches, the differences ought to be as often transcribed as they are so diversely linked. Take the differences between each price, and the mean rate, and set them alternately, and they will be the quantities required.

When the simple rates do not exceed three, there can be but one way of linking; but when they exceed three, there are several ways, and every way brings different answers: also any proportional numbers to the answer found by this rule will likewise be the answer to the question? These questions are all proved by Alligation Medial.

(1) How much raisins at 7 annas per seer, and at 4 annas per seer, may be mixed together for 6 annas per seer?

(2) How much rice at 4 rupees per maund, at 3 rupees per maund, and at 2 rupees per maund, will make a mixture worth 2rs. 8as. per maund?

(3) A man would mix four sorts of tea together, viz. one sort at 4 rupees per seer, another at 3rs. 8as. a third at 3 rupees, and a fourth at 2 rupees per seer,

and he is desirous to mix so much of each sort together, that the whole may be sold at 2rs. 8as. per seer : I demand, how much he must take of each sort ?

(4) Gram at 4 rupees per maund, at 3rs. 8as. at 2rs. 8as. and at 2 rupees per maund ; how much of each sort will make a composition worth 3 rupees per maund ?

(5) A merchant would mix wine at 14, 19, 15, and 22 rupees per dozen, so as that the mixture may be worth 18 rupees per dozen, what quantity of each must be taken ?

(6) A goldsmith has gold of 17, 18, 22, and 24 carats fine, how much must he take of each sort to make 21 carats fine ?

(7) A vintner would make a mixture of Malaga worth 7rs. 8as. per gallon, with Canary at 6rs. 12as. sherry at 5 rupees per gallon, and white wine at 4rs. 8as. and 4 rupees per gallon ; what quantity of each, must he take, that the mixture may be sold for 6 rupees per gallon ?

Note. This sum will admit of being linked above 20 different ways.

ALLIGATION PARTIAL.

Alligation Partial is when the rates of all the things, the quantity of but one of them, and the mean rate of the whole mixture are given to find the several quantities of the rest, in proportion to the quantity given.

Rule.

First, take the differences between each price, and the mean rate, and place them alternately, as in Alligation Alternate. Then say.

As the difference of the same name with the quantity given

Is to the rest of the differences severally ;

So is the quantity given
 To the several quantities required.
 Or, As the difference opposite the price of which
 the quantity is given
 Is to the said given quantity ;
 So is each other difference
 To the quantity required.

Prove questions in this rule as in Alligation Alternate.

(1) How much water must I mix with 63 gallons at 4rs. 1a. per gallon, to reduce it to 3rs. 6as. per gallon ?

(2) A man being determined to mix 12 maunds of gram at 18 annas per maund, with kolye at 30 annas, peas at 36 annas, and beans at 48 annas per maund ; I demand how much kolye, peas, and beans, must be mixed with 12 maunds of gram, that it may bear the price of 22 annas per maund ?

(3) A man being determined to mix 12 maunds of beans at 3 rupees per maund, with peas at 2rs. 8as. with kolye at 1r. 8as. and with gram at 12 annas per maund ; I demand how much peas, kolye and gram, must be mixed with the 12 maunds of beans, that the whole may be sold for 1r. 12as. per maund ?

(4) A man mixed 10 maunds of potatoes at 1r. 8as. per maund with other potatoes at 2rs. 8as. at 3rs. and at 4rs. per maund : I demand how much he mixed with the 10 maunds at 1r. 8as. that the whole may bear the price of 2rs. 12as. per maund ?

(5) Required to mix 12 maunds of rice at 18 annas per maund, with patcherry rice at 30 annas per maund, with Patna rice at 36 annas, and Dacca rice at 48 annas per maund, I demand how much of each sort must be mixed with the 12 maunds, that the whole quantity may bear the price of 42 annas per maund ?

(6) With 60 gallons of brandy at 4 rupees per gallon I mix brandy of 3rs. 8as. per gallon, and some water, then I find, it stands me in 3 rupees per gal

lon, I demand how much brandy and how much water I took?

(7) How much Malaga of 7rs. 5as. per gallon, sherry at 5rs. 2as. per gallon, and white wine of 4rs. 2as. the gallon, must be mixed with 20 gallons of Canary at 6rs. 8as. per gallon, so that one gallon of the mixture may stand me in 6 rupees?

ALLIGATION TOTAL.

Alligation Total is when the rates of the several things, the quantity to be compounded, and the mean rate of the whole mixture are given to find, how much of each sort will make up the quantity.

Rule.

First, place the differences between the several prices and the mean rate alternately, as in Alligation Alternate, then say, °

As the sum of the differences
Is to the whole composition;
So is the difference of each rate
To the quantity of the same rate.

(1) A chandler has 4 sorts of sugar, viz. at 8 annas per seer, at 6 annas per seer, at 4 annas per seer, and at 2 annas per seer, and he would have a composition of a maund weight, worth 5 annas per seer, I demand how much of each sort he must take?

(2) A vintner has 4 sorts of wine, viz. Canary at 10 rupees per gallon, Malaga at 8 rupees per gallon, Rhenish at 6 rupees, and Oporto at 4 rupees, and he is minded to make a composition of 60 gallons worth 9 rupees per gallon, I demand how much of each sort he must have?

(3) A punch-wallah has 3 sorts of arrack, viz. at 10 annas per gallon, at 8 annas per gallon, and at 6 annas per gallon, and he would have a composition of 30 gallons, worth 7 annas per gallon. I demand how much of each sort he must have?

(4) A goldsmith has several sorts of gold, viz. some of 24 carats fine, some of 22 carats fine, and some of 18 carats fine, and he would have compounded of these sorts, the quantity of 60 ounces of 20 carats fine. I demand, how much of each sort he must take?

(5) A goldsmith has gold of three sorts, viz. 6 of 22 carats fine, of 21 carats fine, and of 20 carats fine, and he would mix with these, so much alloy, as that the quantity of 21 ounces may bear 18 carats fine. I demand how much of each sort he must take, and how much alloy?

(6) A druggist has 3 sorts of drugs : one was worth $\frac{1}{2}$ rupees per seer, another 5 rupees per seer, and another 8 rupees per seer, and out of these he made 2 parcels, one was 21 seers at 6 rupees per seer, and another 35 seers at 7 rupees per seer, how much of each sort did he take for each parcel?

(7) Let it be required of a person to mix gram at 5 rupees per maund, with kolye at 3rs. 8as. per maund, so as the whole quantity may be 27 maunds, to be sold for 4rs. 4as. per maund; what quantity of each must be taken to make up the mixture?

SINGLE POSITION.

Position, by some called the rule of false or negative arithmetic, because we suppose some uncertain number, that by reasoning from it, we may gain a true number.

Rule.

Single position requires only one supposition to discover the true result.

Suppose any number you think proper, and work with it as if it was the true number in the same proportion as the question directs, and if the result be either too much, or too little, you may find out the number sought by this proportion.

Is the result of the position
 Is to the position ;
 So is the given number.
 To the number required.

Prove these sums by working with the required number, as the question directs.

(1) A. lent B. a sum of money to be paid at 4 payments. When 3 of them were made, and A. came to demand the fourth, B. would give him no more, except he would tell him, how much was paid already. A. said the first payment was a fourth, the second a fifth, and the third a sixth of the sum first lent; and all together made $7\frac{1}{2}$ rupees; I demand the sum lent?

(2) One man carrying a bag of money in his hand, another asked him, how much was in it; he answered, he could not tell; but the third, fourth and fifth of it made $9\frac{1}{2}$ rupees. how much was in the bag?

(3) I have delivered to a banker a certain sum of money, to receive of him after the rate of 6 rupees per cent per annum; and at the end of 10 years he paid me 500 rupees for principal and interest together: I demand the sum delivered to him at first?

(4) Three persons, viz. A. B. and C. thus discourse together concerning their ages; says B. to A. I am as old and half as old again as you; then says C. to B. but I am twice as old as you; A. replied, I am sure the sum of all our ages is 165: now I demand each man's age?

(5) Three persons, Andrew, Benjamin & Charles, are to go a journey of 235 miles; of this journey Andrew is to go a certain number of miles unknown; Benjamin is to go four times as many miles as Andrew, and three miles more, and Charles is to go twice as many miles as Benjamin, and 5 miles more: how many miles must each of these persons travel separately?

(6) There were in company together four persons,

Dick, Tom, Bob, and Harry; Dick told Bob, that he was older than him by two years; Tom told him, that he was as old as both of them together, and four years older; Harry hearing them, said I am just 96 years old, and that is equal to all your ages; how old was each of them severally?

(7) Bought 5 maunds of silk of three different qualities viz A. 1 maund, B. $1\frac{1}{2}$ maund, and C. $2\frac{1}{2}$ maunds, at 9 rupees per seer, one with another. How ought I to sell a seer of each quality to gain 10 per cent upon the whole, when the quality of A. is double the value of B. and the quality of B. double the value of C?

(8) A person bought a chaise, horse and harness, for £.60 the horse came to twice the price of the harness, and the chaise to twice the price of the horse and harness: what did he give for each?

(9) A vessel has three cocks, A. B. and C. A. can fill it in 1 hour, B. in 2 and C. in 3: in what time will they fill it together?

DOUBLE POSITION.

Double position is that, which discovers the true number sought, by making use of two supposed numbers.

Rule.

1st. Suppose any two numbers; and proceed with them, as if they were the true numbers, in the same proportion as the question directs.

2dly. The result or errors must be placed against their positions or supposed numbers; thus:

pos.	er.
40	28
36.	19

3dly. Multiply them crosswise.

4thly. If the errors are alike, i. e. both greater or both less than the given number, take their diffe-

rence for a divisor, and the difference of their products for a dividend.

5thly. If the errors are unlike, take their sum for a divisor, and the sum of the products for a dividend, the quotient thence arising will be the answer.

(1) A. B. and C. would divide 100 rupees, between them, so as that B. may have 3 rupees more than A. and C. 4 rupees more than B; I demand how much each man must have?

(2) A man lying at the point of death, said he had in certain coffers 10,000 rupees, which he bequeathed to 3 of his friends after this manner:—The first must have a certain portion, the second must have twice as much as the first, wanting 800 rupees, and the third must have three times as much as the first wanting 1500 rupees: I demand, how much each man must have?

(3) A. B. and C. built an house, which cost 10,000 rupees, of which A. paid a certain sum, B. paid 1000 rupees more than A. and C. paid as much as A. and B. I demand each man's share in that charge?

(4) A young gentleman walking in a garden and meeting with a bevy of young ladies, began thus to address them: Bless you all ten fair ladies: Sir, replies one, you are mistaken, we are not ten, but, if we were twice as many more as we are, we should be as many above 10, as we are now below: what was their number?

(5) A gentleman has two horses of good value, and a saddle worth 500 rupees, which set on the back of the first horse, made his value double that of the second; but, if set on the back of the second horse, is worth triple that of the first horse, I demand the value of each horse?

(6) A lady bought lace at 4 rupees a yard, and persian at 2 rupees; the whole number of yards she bought were eight, and the whole price 20 rupees: how many yards had she of each sort?

(7) A. and B. having a certain number of gold

mohurs, says B. to A. give me one of your gold mohurs, and I shall have as many as you; but says A. to B. give me one of your gold mohurs, and I shall have twice as many as you; how many had each?

(8) A man had 2 silver cups, of unequal weight, having one cover to both, of 5oz. Now, if the cover is put on the lesser cup, it will double the weight of the greater cup, and set on the greater cup, it will be thrice as heavy as the lesser cup, what is the weight of each cup?

(9) A gentleman bought a house with a garden, and a horse in the stable for £500. Now he paid 4 times the price of the horse for the garden, and 5 times the price of the garden for the horse. What was the value of the house, garden and horse separately?

(10) When first the marriage knot was tied,
 Betwixt my wife and me,
 My age did her's as far exceed,
 As three times three does three;
 But when ten years, and half ten years,
 We man and wife had been;
 Her age came up as near to mine,
 As eight is to sixteen.
 What both our ages, were, I pray,
 Now tell me, on the wedding day?

INVOLUTION

AND

EVOLUTION.

INVOLUTION is the raising of any given number to any proposed powers.

EVOLUTION is the unravelling, or unfolding any proposed number into the parts, of which it was made up, or composed.

If any number is multiplied into itself, that product is called a square number.

Thus the square numbers, 4, 9, 16, 25, 36, &c. are each of them composed of two equal numbers, viz. $2 \times 2 = 4$, $3 \times 3 = 9$, $4 \times 4 = 16$.

If any number is multiplied into itself, and that product is multiplied into the same number, the second product is called a cube number.

Thus the cube numbers, 8, 27, 64, &c. are each composed of $2 \times 2 \times 2 = 8$; $3 \times 3 \times 3 = 27$, $4 \times 4 \times 4 = 64$, &c.

These powers exist in nature, viz. a root is represented by a line or side having but one dimension, viz. only length: the square is a plain figure of two dimensions, viz. length and breadth; and the cube of three, viz. length, breadth, and thickness.

All the superior powers have no existence in nature; but are composed of a multiplication of any number four or more times into itself.

Thus, $2 \times 2 \times 2 \times 2 = 16$ the biquadrate, whose root is 2.

Or $3 \times 3 \times 3 \times 3 \times 3 = 243$ the sursolid, whose root is 3, have no existence in nature, but may be understood, as a series of numbers in geometrical progression.

Note. \odot signifies involution thus, $27 \odot$ or 27^3 , signifies that 27 is to be involved into the third power.

$\sqrt{\quad}$ or $\sqrt[3]{\quad}$ denotes evolution, thus, $\sqrt{4} = 2$ signifies that the square root of 4 equals 2, or $\sqrt[3]{27} = 3$ the cube, or root, of the third power of $27 = 3$.

- (1) What is the square of 17. 1?
- (2) What is the square of .09?
- (3) What is the square of .0094?
- (4) Produce the square of 500.

EXTRACTION

OF THE

SQUARE ROOT.

EXTRACTING the square root, is to find out such a number, as being multiplied into itself, the product will be equal to the given number.

Rule.

1st. Point the given number, beginning at the units place, then to the hundreds, and so upon every second figure throughout.

2dly. Seek the greatest square number in the first point towards the left hand, placing the square number under the first point, and the root thereof in the quotient, subtract the square number from the first point, and to the remainder bring down the next point, and call that the resolvend.

3dly. Double the quotient, and place it for a divisor on the left hand of the resolvend; seek how often the divisor is contained in the resolvend (preserving always the unit's place,) and put the answer in the quotient, and also on the right-hand side of the divisor; then multiply by the figure last put in the quotient, and subtract the product from the resolvend; bring down the next point to the remainder (if there be any more) and proceed as before.

Roots, 1 2 3 4 5 6 7 8 9 .

Squares, 1 4 9 16 25 36 49 64 81 .

- (1) What is the square root of 22071204?
- (2) What is the square root of 119550669121?
- (3) What is the square root of 2268741?
- (4) What is the square root of 6?

When the given number consists of a whole num;

ber and decimals together, make the number of decimals even, by adding cyphers to them, so that there may be a point fall on the unit's place of the whole number.

- (5) What is the square root of 7.24683?
- (6) What is the square root of 2.2710957?
- (7) Extract the square root of 1850701.764025?
- (8) What is the square root of .0007612816?

To extract the square root of a vulgar fraction,

Rule.

Reduce the fraction to its lowest terms; then extract the square root of the numerator for a new numerator, and the square root of the denominator, for a new denominator.

If the fraction be a surd, (i. e.) a number where a root can never be exactly found, reduce it to a decimal, and extract the root of it.

- (1) What is the square root of $\frac{3364}{5716}$?
- (2) What is the square root of $\frac{3416}{5460}$?
- (3) What is the square root of $\frac{7016}{9216}$?

S U R D S.

- (1) What is the square root of $\frac{3168}{6192}$?
- (2) What is the square root of $\frac{207}{72}$?
- (3) What is the square root of $\frac{327}{738}$?

To extract the square root of a mixed number.

Rule.

1st. Reduce the fractional part of the mixed number to its lowest term, and then the mixed number to an improper fraction.

2dly. Extract the roots of the numerator and denominator for a new numerator and denominator.

3dly. If the mixed number given be a surd, reduce the fractional part to a decimal, annex it to the whole number, and extract the square root thereof.

- (1) What is the square root of $27\frac{1}{4}$?
- (2) What is the square root of $17\frac{1}{4}$?
- (3) What is the square root of $5\frac{1}{4}$?

S U R D S.

- (1) What is the square root of $76\frac{1}{4}$?
- (2) What is the square root of $7\frac{1}{4}$?

T H E A P P L I C A T I O N.

(1) There is an army consisting of a certain number of men, who are placed rank and file, (that is, in the form of a square, each side having 576 men.) I desire to know how many the whole square contains?

(2) A certain pavement is made exactly square, each side of which contains 97 feet. I demand how many square feet are contained therein?

To find the mean proportional between any two given numbers.

Rule.

The square root of the product of the given numbers is the mean proportional sought.

(1) What is the mean proportional between 4276 and 842?

To find the side of a square equal in area to any given superficies.

Rule.

The square root of the content of any given superficies, is the square equal sought.

(1) If the content of a given circle be 160—what is the side of the square?

(2) If the area of a circle be 750—what is the side of the square equal?

The area of a circle given to find the diameter.

Rule.

As 355 : 452, or, as 1 : 1,273239 :: the area to the square of the diameter :—or, multiply the square root of the area, by 1.12837. and the product will be the diameter.

(1) What length of cord will be fit to tie to a cow's tail, the other end fixed in the ground, to let her have liberty of eating an acre of grass, and no more, supposing the cow and tail to be $5\frac{1}{2}$ yards?

The area of a circle given to find the periphery or circumference.

Rule.

As 113 : 1420, or, as 1 : 12,56637 :: the area to the square of the periphery, : or, multiply the square root of the area, by 3,5449, and the product is the circumference.

(1) When the area is 12—what is the circumference?

Any two sides of a right-angled triangle given to find the third side.

1. The base and perpendicular given to find the hypotenuse.

Rule.

The square root of the sum of the squares of the base and perpendicular, is the length of the hypotenuse.

(1) The top of a castle from the ground is 45 yds high, and surrounded with a ditch of 60 yards broad; what length must a ladder be, to reach from the outside of the ditch, to the top of the castle?

(2) The wall of a town is 25 feet high, which is surrounded by a moat of 30 feet in breadth. I demand the length of a ladder, that will reach from the outside of the moat to the top of the wall?

2. The hypotenuse and perpendicular given to find the base.

Rule.

The square root of the difference of the squares of the hypotenuse and perpendicular, is the length of the base.

(1) If the hypotenuse is 75 yards, and the perpendicular height 45 yards, what is the base?

3. The base and hypotenuse given to find the perpendicular.

Rule.

The square root of the difference of the squares of the hypotenuse and base is the height of the perpendicular.

(1) If the base be 30 feet in breadth, and the hypotenuse 39.05 feet, what is the perpendicular?

Any number of men being given to form them into a square battalia, or to find the number of rank and file.

Rule.

The square root of the number of men given, is the number of men either in rank or file.

(1) An army consisting of 331776 men, I desire to know how many rank and file?

(2) A certain square of pavement contains 48841 square stones, all of the same size. I demand how many are contained in one of the sides?

EXTRACTION OF THE CUBE ROOT.

TO extract the cube root, is to find out a number, which being multiplied into itself, and then, into that product, produceth the given number.

Rule.

1st. Point every third figure of the cube given, beginning at the unit's place; seek the greatest cube to the first point, and subtract it therefrom; put the root in the quotient, and bring down the figures in the next point to the remainder for a resolvend.

2dly. Find a divisor, by multiplying the square of the quotient by 3. Seek how often it is contained in the resolvend, rejecting the units and tens, and put the answer in the quotient.

3dly. To find the subtrahend. 1. Cube the last figure in the quotient. 2. Multiply all the figures in the quotient by 3, except the last, and product by the square of the last. 3. Multiply the divisor by the last figure. Add these products together, and it will give the subtrahend; which subtract from the resolvend; to the remainder bring down the next point, and proceed as before.

Roots, 1 . 2 . 3 . 4 . 5 . 6 . 7 . 8 . 9
Cubes, 1 . 8 . 27 . 64 . 125 . 216 . 343 . 512 . 729 .

- (1) What is the cube of 6.4?
- (2) What is the cube of 4.11?
- (3) What is the cube of .13?
- (4) What is the cube of .09?
- (5) What is the cube of .007?
- (6) What is the cube root of 389017?
- (7) What is the cube root of 5735339?
- (8) What is the cube root of 673373097125?

When the given number consists of a whole number, and decimals together, make the number of decimals consist of 3, 6, 9, &c. places, by adding cyphers thereto, so that there may be a point fall on the unit's place of the whole number.

- (9) What is the cube root of 7612.812161?
- (10) What is the cube root of 12.977875?
- (11) What is the cube root of .001906624?
- (12) What is the cube root of 36155.027576?

To extract the cube root of a vulgar fraction.

Rule.

Reduce the fraction to its lowest terms, then extract the cube root of its numerator and denominator, for a new numerator and denominator; but, if the fraction be a surd, reduce it to a decimal, and then extract the root from it.

- (1) What is the cube root of $\frac{3}{11}$?
- (2) What is the cube root of $\frac{1}{111}$?
- (3) What is the cube root of $\frac{1}{1111}$?

SURDS.

- (1) What is the cube root of $\frac{1}{2}$?
- (2) What is the cube root of $\frac{1}{3}$?
- (3) What is the cube root of $\frac{1}{4}$?

To extract the cube root of a mixed number.

Rule.

Reduce the fractional part to its lowest terms, and then the mixed number to an improper fraction; extract the cube roots of the numerator and denominator, for a new numerator and denominator; but, if the mixed number given be a surd, reduce the fractional part to a decimal, annex it to the whole number, and extract the root therefrom.

- (1) What is the cube root of $405\frac{1}{2}$?
- (2) What is the cube root of $42\frac{1}{2}$?
- (3) What is the cube root of $5\frac{1}{2}$?

SURDS.

- (1) What is the cube root of $8\frac{1}{2}$?
- (2) What is the cube root of $7\frac{1}{2}$?

THE USE OF THE CUBE ROOT.

CASE 1.—To find the side of a cube, that shall be equal in solidity to any given solid, as a globe, cylinder, prism, cone, &c.

Rule.

Extract the cube root of the solid content of the given body, which root will be the side of the cube required.

(1) There is a stone of a cubic form, which contains 21952 solid feet. What is the superficial content of one of it's sides?

CASE 2.—Having the dimensions of any body, to find the dimensions of another similar body, that shall be any number of times greater or less than the solid given.

Rule.

Multiply the cube root of each side by the difference between the solid given and that required, if greater (or divide by the difference, if less) than the solid given; then extract the cube root of each product or quotient, which will be the dimensions of the solid required.

(1) Suppose the length of a ship's keel to be 125 feet, the breadth of the midship beam 25 feet, and the depth of the hold 15 feet, I demand the dimensions of another ship of the same form, that carries 3 times the burthen.

-CASE 3.—Having the dimensions and capacity of a solid, to find the dimensions of a similar solid of a different capacity.

Rule.

Like solids are in triplicate proportion to their homologous sides, therefore it will be, As the cube of a dimension : is to it's given weight :: so is the cube of any like dimension : to the weight sought.

(1) Suppose a ball of 4 inches diameter weighs 18lb. I demand the diameter of another that weighs 114lb.

CASE 4.—To find two mean proportionals between two given numbers.

Rule.

Divide the greater extreme by the less extreme; and the cube root of the quotient, multiplied by the less extreme, multiply the said cube root by the lesser mean, and the product will be the greater mean proportional.

(1) What are the two mean proportionals between 7 and 189?

(2) Find two mean proportionals between 4 and 256?

EXTRACTING OF THE BIQUADRATE ROOT.

To extract the biquadrate root, is to find out a number, which being involved four times into itself, will produce the given number.

Rule.

First extract the square root of the given number, and then extract the square root of that square root, and it will give the biquadrate root required.

(1) What is the biquadrate of 48?

(2) What is the biquadrate of 96?

(3) What is the biquadrate root of 5308416?

(4) What is the biquadrate root of 81934656?

(5) What is the biquadrate root of 21743271936?

OF THE SURSOLID ROOT.

Any number involved five times produce a sursolid.

To extract the root of a sursolid, use the same rule as in extracting the cube root

(1) What is the sursolid of 48?

(2) What is the sursolid root of 8153726976?

- (3) What is the sursolid root of 254803968?
 (4) What is the sursolid root of 839416423424?
-

OF THE SQUARE CUBE ROOT.

Any number involved six times produces a square cube, and to extract the square cube root, first depress the given resolvend to a cube, by extracting the square root, and the cube root of that resolvend, when extracted, will produce the square cube root required.

- (1) What is the square cube of 48?
 (2) What is the square cube root of 782757789
 696?
 (3) What is the square cube root of 12230590
 464?
 (4) What is the square cube root of 3206175906
 5948?
-

OF THE SECOND SURSOLID ROOT.

Any number involved seven times produces a second sursolid, and to extract the root of a second sursolid, use the same rule as in extracting the cube root.

- (1) What is the second sursolid of 96?
 (2) What is the second sursolid root of 751447
 47810816?
 (3) What is the second sursolid root of 5870683
 42272?
 (4) What is the second sursolid root of 12311
 71548132409344?
-

OF THE SQUARE BIQUADRATE ROOT.

Any number involved eight times is a biquadrate

square, or square biquadrate, and to extract the square biquadrate root, extract the square root of the given resolvend, which will reduce it to a biquadrate number, which call a new resolvend, the square root of which will be a square number, of which extract the square root, which root will be the result required.

- (1) What is the squared biquadrate of 48?
- (2) What is the square biquadrate root of 721 3895789838336?
- (3) What is the square biquadrate root of 2817 9280429056?
- (4) What is the square biquadrate root of 4727 69874482845188096?

OF THE CUBED CUBE ROOT.

Any number involved nine times is a cubed cube, and to extract it's root, extract the cube root of the given resolvend, and the result will be a cubick resolvend, of which extract the cube root also, which will be the root of the ninth power required.

- (1) What is the cubed cube root of 692533995 824480256?
- (2) What is the cubed cube root of 1352605460 594688?
- (3) What is the cubed cube root of 18154363180 141255228864?

OF THE SQUARE SURSOLID ROOT.

Any number involved ten times produces a squared sursolid, and to extract its root, first square the given resolvend, which depresses it to a sursolid, whose root, being extracted, produces the square sursolid root.

- (1) What is the squared sursolid root of 649250 62108545024?

(2) What is the squared sursolid root of 664832 63599150104576?

(3) What is the squared sursolid root of 697127 54611742420055883776?

OF THE THIRD SURSOLID ROOT.

Any number involved eleven times produces a third sursolid, and to extract its root, use the same rule as in extracting the cube root.

(1) What is the third sursolid root of 95280975 7913927?

(2) What is the third sursolid root of 31164029 81210161152?

(3) What is the third sursolid root of 6382393 305518410039296?

OF THE SQUARED SQUARE CUBE ROOT.

Any number involved twelve times produces a squared square cube; and to extract its root first square the given resolvend, which depresses it to a square cube, then proceed as in extracting the square cube root.

(1) Extract the root of this squared square cube of 149587343098087735296?

(2) What is the root of this squared square cube of 612709757329767363772416?

(3) What is the root of this squared square cube of 10279563944029090291760398073856?

PROGRESSION,

Consists of two parts, Arithmetical and Geometrical.

ARITHMETICAL PROGRESSION,

Is, when the rank of numbers increase or decrease regularly by the continual adding or subtracting of the equal numbers. As 1, 2, 3, 4, 5, 6, are in Arithmetical Progression, by the continual increasing or adding of one; 11, 9, 7, 5, 3, 1, by the continual decreasing or subtracting of two.

Note. When any even number of terms differ by Arithmetical Progression, the sum of the two extremes will be equal to the two middle numbers, or any two means equally distant from the extremes; as 2, 4, 6, 8, 10, 12, where $6 + 8$, the two middle numbers are $= 12 + 2$, the two extremes, and $= 10 + 4$ the two means, $= 14$.

When the number of terms are odd, the double of the middle term will be equal to the two extremes, or of any two means equally distant from the middle term; as 1, 2, 3, 4, 5, where the double of 3 $= 5 + 1 = 2 + 4 = 6$.

In Arithmetical Progression five things are to be observed, viz.

1. The first term; better expressed thus,.....F.
2. The last term,.....L.
3. The number of terms,.....N.
4. The equal difference,.....D.
5. The sum of all the terms,.....S:

Any three of which being given, the other two may be found.

The first, second, and third terms given, to find the fifth.

Rule.

Multiply the sum of the two extremes, by half the number of terms, or multiply half the sum of the two extremes, by the whole number of terms, the product is the total of the terms: or thus,

1. F, L, N, are given to find—S.

$$\overline{F+L} + \frac{N}{2} = S$$

(1) How many strokes do the clocks of Venice (which go on to 24 o'clock) strike in the compass of a natural day?

(2) The length of my garden is 94 feet: now if eggs be laid along the pavement a foot asunder, to be fetched up singly to a basket removed one foot from the last, how much ground must he travel, that does it?

(3) If 100 eggs were placed in a right line, exactly a yard asunder from one another, and the first a yard from a basket, what length of ground does that man go, who gathers up these 100 eggs singly, returning with every egg to the basket to put it in?

The first, second, and third terms given, to find the fourth.

Rule.

From the second, subtract the first, the remainder, divided by the third less one, gives the fourth: Or thus,

2. F, L, N, are given to find D.

$$\frac{L-F}{N-1}=D$$

(1) If the extremes be 3 and 19, and the number of terms 9, it is required to find the common difference, and the sum of the whole series?

(2) One had 12 children, that differed alike in their ages, the youngest was nine years old, the elder $36\frac{1}{2}$: what was the difference of their ages?

(3) There are 21 men, whose ages are equally distant from each other in Arithmetical Progression, the youngest is 20 years old, and the eldest is 60: I demand the common difference of their ages?

(4) A debt is to be discharged at 11 several payments in Arithmetical Progression, the first payment to be 12rs. 8as. and the last 63 rupees: what is the debt, and what must each payment be?

(5) A man is to travel from Calcutta to a certain place in ten days, and to go but two coss the first

day, increasing every day's journey by an equal excess, so that the last day's journey may be 29 coss: what will each day's journey be, and how many coss is the place he goes to, distant from Calcutta?

The first, second, and fourth terms given to find the third.

Rule.

From the second, subtract the first, the remainder divide by the fourth, and to the quotient add 1, gives the third: Or thus,

3. F, L, D, are given to find N.

$$\frac{L-F}{D} + 1 = N$$

(1) A man going a journey, his first day's travel was 5 coss, his last day's travel 35 coss, he increased his journey every day 3 coss: how many days did he travel?

(2) A man being asked how many sons he had, said, that the youngest was 4 years old, and the eldest 32, and that he increased one in his family every 4 years. What number had he?

The second, third and fourth terms given, to find the first.

Rule.

Multiply the fourth by the third, made less by 1, the product subtracted from the second gives the first: or thus,

4. L, N, D, are given to find F.

$$\frac{L-D}{N-1} = F.$$

(1) A man in six days went from Calcutta to Moorshedabad; every day's journey was greater than the preceding one by four coss, his last day's journey was 40 coss; what was the first?

(2) A man takes out of his pocket, at eight several times, so many different numbers of shillings,

every one exceeding the former by 6, the last 46—
what was the first?

The fourth, third, and fifth given to find the first.

Rule.

Divide the fifth by the third, and from the quotient subtract half the product of the fourth multiplied by the third, less 1, gives the first: or thus,

5. N, D, S, are given to find F.

$$\frac{S}{N} \frac{D \times N - 1}{2} = F.$$

(1) Suppose it 100 coss between Calcutta and Berhampore, two hircarrahs set out from each place on the same road, that from Calcutta towards Berhampore, travelling every day two coss more than the day before; the other from Berhampore to set off one day after, travelling every day three coss more than the preceding one, and that they meet exactly half way; the first at the end of five days, and the other at the end of four: how many coss did each travel per day?

(2) A man is to receive 300 rupees at 12 several payments, each payment to exceed the former by four rupees: he is willing to bestow the first payment on any one, who can tell him what it is. What must that person receive for his pains?

The first, third and fourth given, to find the second.

Rule.

Subtract the fourth term from the product of the third; multiplied by the fourth, that remainder added to the first, gives the second: or thus,

6. F, N, D, are given to find L.

$$N D - D + F = L.$$

(1) What is the last number of an Arithmetical Progression, beginning at 6, and continuing by the increase of 8 to 20 places?

(2) A gentleman bargains with a bricklayer to sink him a well 20 fathoms deep, upon these terms, viz. to pay him 3 rupees for the first fathom, 5 for the second, 7 for the third, &c. raising two every fathom: what will be due to the bricklayer, for completing the same?

(2) Bought 19 yards of shalloon, and gave 1 rupee for the first yard, 3 rupees for the second, 5 rupees for the third, &c. increasing 2 rupees every yard: I demand, what I gave for the 19 yards?

(3) A mercer sold 20 yards of silk, at 3 rupees for the first yard, 6 rupees for the second, 9 rupees for the third, &c. increasing 3 rupees every yard: I demand, what he sold the 20 yards for?

(4) A butcher bought 100 heads of cattle, viz. Oxen, and gave for the first ox 1 rupee, for the second ox 2 rupees, for the third ox 3 rupees, &c. I demand, what the cattle cost him?

The first term, number of terms, and sum of all the series given, to find the common excess.

Rule.

Divide the double sum of all the series by the number of terms, and from the quotient subtract double the first term: divide the remainder by the number of terms lessened by unity, the quotient will be the common excess.

(1) A gentleman travelled 100 leagues in eight days, and every day travelled equally farther than the preceding day: it is known that the first day he travelled two leagues: how many leagues did he travel each of the other days?

When one person, or thing, moves with an equal, and another the same way by a progressive motion, to find in what time the first will be overtaken.

Rule.

Add the common excess of the pursuer's day's journey to double the space gone each day by the pursu-

ed, from that sum subtract double the space that the pursuer travelled the first day, and divide the remainder by the common excess, the quotient will give the number of days, in which the pursued will be overtaken by the pursuer.

(1) A noted decoit having committed a robbery, (not suspecting a pursuit,) fled northward at the rate of eight coss a day; a sepoy upon the scent, follows him in a progressive motion, only three coss the first day, 5 the next, 7 the third, and so on, increasing every day 2 coss: in how many days will the decoit be overtaken?

GEOMETRICAL PROGRESSION.

Is the increasing or decreasing of any rank of numbers by some common ratio; that is, by the continual multiplication or division of some equal number, as 2, 4, 8, 16, increase by the multiplier 2, and 16, 8, 4, 2 decrease by the divisor 2.

Note. When any number of terms is continued in Geometrical Progression, the product of the two extremes will be equal to any two means equally distant from the extremes; as 2, 4, 8, 16, 32, 64, where $64 \times 2 = 4 \times 32$, and $8 \times 16 = 128$.

When the number of terms are odd, the middle term multiplied into itself, will be equal to the two extremes, or any two means equally distant from the mean: as 2, 4, 8, 16, 32, where $2 \times 32 = 4 \times 16 = 8 \times 8 = 64$.

In Geometrical Progression the same five things are to be observed as in Arithmetical, viz.

1. The first term,
2. The last term,
3. The number of terms,
4. The equal difference or ratio,
5. The sum of all the terms.

Note. As the last term in a long series of num-

bers is very tedious to come at by continual multiplication; therefore for the readier finding it out, there is a series of numbers made use of in Arithmetical Proportion, called indices, beginning with an unit, whose common difference is one; whatever number of indices you make use of, set as many numbers in such Geometrical Proportion, as is given in the question under them.

As 1, 2, 3, 4, 5, 6, indices
2, 4, 8, 16, 32, 64, numbers in Geometrical
[Proportion.

But if the first term in Geometrical Proportion be different from the ratio, the indices must begin with a cypher,

As 0, 1, 2, 3, 4, 5, 6, indices
1, 2, 4, 8, 16, 32, 64, numbers in Geome-
[trical Proportion.

When the indices begin with a cypher, the sum of the indices made choice of must always be one less than the number of terms given in the question; for 1, in the indices is over the second term, and two, over the third, &c.

Add any two of the indices together, and that sum will agree with the product of their respective terms.

As in the first table of indices,	$2 + 5 = 7$
Geometrical proportion,	$4 \times 32 = 128$
Then in the second, }	$2 + 4 = 6$
	$4 \times 16 = 64$

In any Geometrical Progression proceeding from unity, the ratio being known, to find any remote term, without producing all the intermediate terms.

Rule.

1. Find what figures of the indices added together, would give the exponent of the term wanted, then multiply the numbers standing under such exponent, into each other, and it will give the term required.

When the exponent 1 stands over the second term, the number of exponents must be 1 less than the number of terms.

(1) The extremes of a Geometrical Progression are 1 and 65536, and the ratio 4: what is the sum of the series?

(2) The first term of a series in Geometrical Progression is 1, the last term is 2187, and the ratio 3. What is the sum of the series?

(3) A cunning sircar told his master, he had 25 pieces of very good handkerchiefs for sale: upon asking their price, was answered, he should have them for 4 rupees, one with another. The gentleman offers him 3 rupees each, and take all; the sircar tells him it would not be taken; but if he would give him what the 20th would come to, by beginning at the first with a single pice, and doubling only to the 20th, he should have them all: what did they come to a piece?

(4) A man bought a horse, and by agreement, was to give a pice for the first nail, 2 for the second, 4 for the third, &c. There were 4 shoes, and 8 nails in each shoe: I demand, what the horse was worth at that rate?

In any Geometrical Progression, not proceeding from unity, the ratio being given, to find any remote term, without producing all the intermediate terms.

Rule.

2dly. Proceed as in the last, only observe, that every product must be divided by the first term.

(5) A person dying left ten sons, to whom, and to his executor, he bequeathed his estate in the manner following, viz. to his executor for seeing his will performed, 1024 rupees, the youngest son to have as much and half as much, and every son to exceed the next younger in the same ratio of $1\frac{1}{2}$, what is the share of the eldest?

The first term, ratio, and number of terms given, to find the number of all the terms.

Rule.

3dly. Find the last term as before, then subtract the first from it, and divide the remainder by the ratio, less one, to the quotient of which add the greater, gives the sum required.

(1) The first term of a geometric series is 1, the ratio 2, and the number of terms 23; required the last term?

(2) On new-year's day a gentleman married, and received of his father-in-law a gold-mohur, on condition, that he was to have a present on the first day of every month for the first year, which should be double still, to what he had the month before: what was the lady's portion?

(3) One at a sale of horses had a mind to a string of 20 fine ones; but not caring to take them at 20 gold mohurs per head, the jockey consented, that he should, if he thought good, pay but a single anna for the first, doubling it only to the 19th, and he would give the 20th into the bargain: this being presently accepted, how were they sold?

(4) A merchant sold 15 cubits of satin, the first cubit for 1 anna, the second for 2 annas, the third for 4 annas, the fourth for 8 annas, &c. I demand the price of the 15 cubits?

(5) A draper sold 20 yards of superfine cloth, the first yard for 3 pice, the second for 9 pice, the third for 27 pice, in triple proportion geometrical: I demand the price of the cloth?

(6) A goldsmith sold a seer of gold at 1 pice for the first chahtack, 4 pice for the second, 16 pice for the third &c. in quadruple proportion geometrical: I demand, what he sold the whole for? Also, how much he gained by the sale thereof, supposing he gave for it 80 rupees per chahtack?

(7) A man worked 20 days at a farmer's and received for the first day's work 4 grains of rice, for

the second 12 grains of rice, for the third 36 grains of rice, and so on in triple proportion geometrical: I demand, what the 20 days labour came to, supposing the whole quantity to be sold at 30 seer per rupee, and each seer containing 15360 grains?

(8) A merchant sold 30 yards of fine velvet, trimmed with gold very curiously, at 2 pins for the first yard, 6 pins for the second, 18 pins for the third, &c. in triple proportion geometrical: I demand, how much the velvet produced, when the pins were afterwards sold at 100 for a pice? Also, whether the said merchant gained or lost by the sale thereof, and how much, supposing the said velvet to have been bought at 200 rupees per yard?

(9) A cunning servant agreed with a master (unskilled in numbers) to serve him eleven years without any reward for his service, but the produce of a grain of rice for the first year, and that product to be sowed the second, and so on, from year to year, allowing the increase to be in a tenfold proportion; it is required to find the sum of the whole produce?

(10) It is reported, that one Sessa, an Indian, having first discovered the game of chess, shewed it to his Prince *Shehram*, who was so delighted with the invention, that he bid him ask what he would, as a reward for his ingenuity; upon which, Sessa requested, that he might be allowed one grain of wheat for the first square on the chess-board, two for the second, four for the third, and so on, doubling continually to 64, the whole number of squares; now, supposing a bushel to contain 640,000 of these grains, it is required to find what number of ships, each carrying 100 tons burthen, might be freighted with the produce, allowing 40 bushels to a ton?

PERMUTATIONS

AND

COMBINATIONS.

THE COMBINATION of QUANTITIES, is the shewing how often a less number of things can be taken out of a greater, and combined together, without considering their places, or the order they stand in.

This is sometimes called, election, or choice; and here every parcel, must be different from all the rest, and no two are to have precisely the same quantities or things.

The **PERMUTATION** of QUANTITIES, is the shewing how many different ways any given number of things may be changed.

This is also called, variation, alternation, or changes; and the only thing to be regarded here, is the order they stand in; for no two parcels are to have all their quantities placed in the same situation.

The **COMPOSITION** of QUANTITIES, is the taking a given number of quantities, out of as many equal rows, of different quantities, one out of every row, and combining them together.

Here no regard is had to their places; and it differs from combination only, as that admits of but one row of things.

COMBINATIONS of the same form, are those, in which there are the same number of quantities, and the same repetitions: thus, *abcc*, *bbad*, *deef*, &c. are of the same form; but *abbc*, *abbb*, *aacc* &c. are of different forms.

Problem 1st.

To find the number of permutations or changes,

that can be made of any given number of things, all different from each other.

Rule.

Multiply all the terms of the natural series of numbers, from 1 up to the given number, continually together, and the last product will be the answer.

The changes on any number of bells not exceeding 12, are exhibited in the following

Table.

The number of things proposed to be varied.	The manner how their several variations are produced.	The different changes or variations every one of the proposed numbers can admit of.
1	1×1	$=1$
2	1×2	$=2$
3	2×3	$=6$
4	6×4	$=24$
5	24×5	$=120$
6	120×6	$=720$
7	720×7	$=5040$
8	5040×8	$=40320$
9	40320×9	$=362880$
10	362880×10	$=3628800$
11	3628800×11	$=39916800$
12	39916800×12	$=479001600$

(1) How many changes may be rung on 12 bells, and what time would it require, supposing 10 changes to be rung in one minute, and the year to consist of 365 days, 5hrs. and 49 minutes?

(2) How many changes may be made of the words in the following verse? *Tot tibi sunt dotes, virgo, quot sydera cælo?*

(3) A person coming to Calcutta, and not thinking it worth while to keep house for himself only,

was desirous of entering into an engagement with a tavern-keeper for his board and lodging during his stay: who was so unconscionable as to demand one thousand rupees per month; the person, who was an arithmetician, being hurt at the proposal, was determined to be even with him if possible, and offered him the money, on condition of being entertained so long as he could place his family and himself, in all 7 persons, every day at dinner in different positions; to which the tavern-keeper readily assented; how long therefore should he be entertained, and at what rate per annum?

(4) Seven gentlemen, that were travelling, met together by chance at a certain inn upon the road, where they were so well pleased with their host, and each other's company, that in a frolick they offered him 30 gold-mohurs to stay at that place so long as they, together with him, could sit every day at dinner, in a different position. The host, thinking that they could not sit in many different positions, because there were but a few of them, and that himself would make no considerable alteration, he being but one, imagined that he should make a good bargain, and readily (for the sake of a good dinner, and better company) entered into an agreement with them, and so made himself the eighth person: I demand, how long they staid at the said inn, and how many different positions they sat in?

Problem 2d.

Any number of different things being given, to find how many changes may be made out of them, by taking a given number of quantities at a time.

Rule.

Take a series of numbers, beginning at the number of things given, and decreasing by 1 to the number of quantities to be taken at a time, and the product of all the terms will be the answer required.

(1) How many words can be made with 5 letters

of the alphabet, admitting that a number of consonants alone will not make a word?

Problem 3d.

Any number of things being given; of which there are several given things of one sort, and several of another, &c. to find how many changes can be made out of them all.

Rule.

1st. Take the series $1 \times 2 \times 3 \times 4$ &c. up to the number of things given, and find the product of all the terms.

2d. Take the series $1 \times 2 \times 3 \times 4$ &c. up to the number of given things of the first sort, and the series $1 \times 2 \times 3 \times 4$ &c. up to the number of given things of the second sort, &c.

3d. Divide the product of all the terms of the first series by the joint product of all the terms of the remaining ones, and the quotient will be the answer required.

(1) How many different numbers can be made of the following figures 1220005555?

(2) How many varieties will take place in the succession of the following musical notes, *fa, fa, fa, sol, sol, la, mi, ra*?

Problem 4th.

To find the changes of any given number of things, taking a given number at a time; in which there are several given things of one sort, several of another, &c.

Rule.

1st. Find all the different forms of combinations of all the given things, taken as many at a time, as in the question.

2d. Find the number of changes in any form, and multiply it by the number of combinations in that form.

3d. Do the same for every distinct form, and the sum of all the products will give the whole number of changes required.

(1) How many changes can be made of every 8 letters out of these ten; *aaaabbccde*?

Problem 5th.

To find the number of combinations of any given number of things, all different from each other, taken, any given number at a time.

Rule.

1st. Take the series 1, 2, 3, 4 &c. up to the number to be taken at a time, and find the product of all the terms.

2d. Take a series of as many terms, decreasing by 1, from the given number out of which the election is to be made, and find the product of all the terms.

3d. Divide the last product by the former, and the quotient will be the number sought.

(1) A general, who had often been successful in war, was asked by his *King*, what reward he should confer upon him for his services; the general only desired a farthing for every file, of 10 men in a file; which he could make with a body of 100 men; what was the amount in pounds sterling.

Problem 6th.

To find the number of combinations of any given number of things, by taking any given number at a time, in which there are several things of one sort, several of another &c.

Rule.

1st. Find by trial, the number of different forms which the things to be taken at a time will admit of, and the number of combinations there are in each.

2d. Add all the combinations, thus found, together, and the sum will be the number required.

(1) Let *aaabbbcc* be proposed, it is required to

find the number of combinations of these quantities, taken 4 at a time?

Problem 7th.

To find the compositions of any number, in an equal number of sets, the things themselves being all different.

Rule.

Multiply the number of things in every set continually together, and the product will be the answer required.

(1) Suppose there are 4 companies, in one of which there are 6 men, in another 8, and in each of the other two, 9; what are the choices, by a composition of 4 men, one out of each company?

(2) How many changes are there in throwing 5 dice?

PART III.

SIMPLE INTEREST,
(BY DECIMALS.)

THE letters made use of in Simple Interest are these :

- P. The principal,
T. The time,
R. The ratio of the rate per cent,
A. The amount.

Ratio signifies only the Simple Interest of 1 rupee for 1 year at any proposed rate of interest per cent, and is found thus :

$$100 : 6 :: 1 : .06$$

$$100 : 5 :: 1 : .05$$

A Table of Ratios.

Rate per cent	Ratio.	Rate per cent	Ratio.
2	.02	$7\frac{1}{2}$	.075
3	.03	8	.08
$3\frac{1}{2}$	.035	$8\frac{1}{2}$	.085
4	.04	9	.09
$4\frac{1}{2}$	.045	$9\frac{1}{2}$	.095
5	.05	10	.1
$5\frac{1}{2}$	.055	$10\frac{1}{2}$	.105
6	.06	11	.11
$6\frac{1}{2}$	.065	$11\frac{1}{2}$	.115
7	.07	12	.12

Note. Any quantity of letters put together like a word, denote continual multiplication.

$\overline{2+3} \times 5 = 25$ signifies that the sum of 2 and 3 multiplied by 5, is equal to 25.

$\overline{3-2} \times 5 = 5$ signifies that the difference between 3 and 2, multiplied by 5, is equal to 5.

$P \times \overline{r-1} = A$. signifies that the principal multiplied by the ratio less 1, is equal to the amount.

Either --- --- --- --- placed over any number of figures or letters, shew that all within that lunule must be wrought by themselves.

Letters thus, *p. t. r.* denote, that the qualities, which they represent, are to be multiplied together.

$3aa + 3a$ signifies 3 times the square of *a* more 3 times *a*.

$3a^2e + 3eea + eee$ signifies 3 times the square of *a* multiplied by *e* more three times the square of *e* multiplied by *a*, more the cube of *e*, as in the cube root.

CASE 1.—When *P. T.* and *R.* are given to find *A.*

Rule.

$$p \, t \, r + p = a.$$

(1) What sum will 567rs. 8as. amount to in 9 years at 6 per cent per annum?

(2) What will 508rs. 14as. amount to in a year at 9 per cent per annum?

(3) What will 7200 rupees amount to in $6\frac{1}{2}$ years at 11 per cent per annum?

(4) What will 1110rs. 8as. amount to in $12\frac{3}{4}$ years at $10\frac{1}{2}$ per cent per annum?

Note. When the time given, does not consist of whole years, then reduce the odd time into decimal parts of a year, and unless such parts of a year chance to be just $\frac{1}{4}$, $\frac{1}{2}$, or $\frac{3}{4}$ of a year, the best way will be to reduce the odd time into days, and then work with the decimal parts of a year, that are equivalent to those days.

Decimal Parts of a Year.

Days.	Decimal parts.	Days.	Decimal parts.
1	.00274	50	.136986
2	.005479	60	.164383
3	.008219	70	.191781
4	.010959	80	.219178
5	.013699	90	.246575
6	.016438	100	.273973
7	.019178	200	.547945
8	.021918	300	.821918
9	.024657	365	1.000000
10	.027397		
20	.054794		
30	.082192		
40	.109589		

$\left. \begin{array}{l} \frac{1}{4} \\ \frac{1}{2} \\ \frac{3}{4} \end{array} \right\} \text{ of a year } \left\{ \begin{array}{l} .25 \\ 5 \\ .75 \end{array} \right.$

(5) What will 7200 rupees amount to in $6\frac{1}{2}$ years at 5 per cent per annum?

(6) What will 1000 rupees amount to in 5 years, at 8 per cent per annum?

(7) What will 280rs. 12as. amount to in 3 years, 148 days, at 12 per cent per annum?

(8) What will 1960 rupees amount to in 189 days, at 10 per cent per annum?

CASE 2.—When A. R. and T. are given to find P.

Rule.

$$tr + 1 = P.$$

(1) I demand what principal will amount to 873rs. 15as. 2. 40p. in 9 years, at 6 per cent per annum?

(2) I demand what principal will amount to 544rs. 10as. 9. 36p. in 1 year, at 9 per cent per annum?

(3) I demand what principal being put to interest for $6\frac{1}{2}$ years, at 11 per cent, will amount to 12348 rupees?

(4) I demand what principal will amount to

2597rs. 2as. 10. 98p. in $12\frac{3}{4}$ years, at $10\frac{1}{2}$ per cent per annum?

(5) I demand what principal will amount to 9540 rupees in $6\frac{1}{2}$ years, at 5 per cent per annum?

(6) What principal will amount to 1400 rupees in 5 years, at 8 per cent per annum?

(7) I demand what principal will amount to 395 rs. 7as. 8. 2792704p. in 3 years and 148 days, at 12 per cent per annum?

(8) What principal, being put to interest for 189 days, at 10 per cent per annum, will amount to 2061 rs. 7as. 10. 150656p?

CASE 3.—When A. P. and T. are given to find R.

Rule.

$$\frac{a-p}{tp} = r.$$

(1) At what rate per cent will 567rs. 8as. amount to 873rs. 15as. 2. 40p. in 9 years?

(2) At what rate per cent will 508rs. 14as. amount to 544rs. 10as. 9. 36p. in a year?

(3) At what rate per cent will 7200rs. amount to 12348 rupees in $6\frac{1}{2}$ years?

(4) At what rate per cent will 1110rs. 8as. amount to 2597rs. 2as. 10. 92p. in $12\frac{3}{4}$ years.

(5) At what rate per cent will 7200 rupees amount to 9540 rupees in $6\frac{1}{2}$ years?

(6) At what rate per cent will 1000 rupees amount to 1400 rupees in 5 years?

(7) At what rate per cent will 280rs. 12as. amount to 395rs. 7as. 8. 2792704p. in 3 years and 148 days?

(8) At what rate per cent will 1960 rupees amount to 2061rs. 7as. 10. 150656p. in 189 days?

CASE 4.—When A. P. and R. are given to find T.

Rule.

$$\frac{a-p}{rp} = t.$$

- (1) In what time will 567rs. 8as. amount to 873rs. 15as. 2. 4p. at 6 per cent?
- (2) In what time will 508rs. 14as. amount to 554rs. 10as. 9.36p. at 9 per cent?
- (3) In what time will 7200 rupees amount to 12348rs. 11as. at 11 per cent?
- (4) In what time will 1110rs. 8as. amount to 2597rs. 2as. 10. 92p. at $10\frac{1}{2}$ per cent?
- (5) In what time will 7200 rupees amount to 9540 rupees at 5 per cent?
- (6) In what time will 1000 rupees amount to 1400 rupees at 8 per cent?
- (7) In what time will 280rs. 12as. amount to 395rs. 7as. 8. 2792704p. at 12 per cent?
- (8) In what time will 1960 rupees amount to 2061rs. 7as. 10. 150656p. at 10 per cent?

ANNUITIES OR PENSIONS IN ARREARS.

Note. U represents the annuity pension or yearly rent. A. R. T. as before.

CASE 1.—When U. R. T. are given to find A.

Rule.

$$\frac{t u t - t u}{2} \times 1 : + t u = a.$$

(1) If an annuity of 700 rupees be forborn 5 years, what will it amount to in that time at 12 per cent?

(2) If the payment of a pension be omitted for 7 years, what will be the amount in that time at 10 per cent, when the pension is 5600 rupees?

Note. When the annuities or rents are to be paid by half-yearly or quarterly payments, take $\frac{1}{2}$ of the ratio, $\frac{1}{2}$ of the yearly rent, and twice the number of years; that is, reduce the years into half years, for

R. U. and T. but for quarterly payments take $\frac{1}{4}$ of the ratio, $\frac{1}{4}$ of the yearly rent, reduce the years into quarters, and work as before.

(3) If 700 rupees annuity payable every half year, were unpaid 5 years; what will it amount to in that time at 12 per cent?

(4) If 700 rupees annuity payable every quarter, were unpaid 5 years; what will it amount to in that time at 12 per cent?

Note. When the payments are monthly, divide the ratio by 12 for R. and proceed as in annual payments; then A. will be equal to the amount for the time given.

(5) An house is let upon lease for 8 months at 500 rupees per month; I demand the amount for that time at 8 per cent for the forbearance of payment?

(6) Suppose a salary of 100 rupees per month be forborn 7 months what is the amount at $4\frac{1}{2}$ per cent?

CASE 2.—When A. R. T. are given to find U.

Rule.

$$\frac{2a}{trt - tr + 2t} = u.$$

(1) If the amount of an annuity for 5 years, at 12 per cent, be 4340rs. what is the annuity?

(2) If the amount of a pension be 50960 rupees, the time be 7 years, and the rate per cent 10, what is the pension?

Note. When the payments are half yearly, 4a. must be divided; but when they are quarterly, then 8a. must be divided; when monthly, r. must be divided as before.

(3) If the amount of an annuity, payable half-yearly for 5 years, at 12 per cent, be 4445 rupees, what is the annuity?

(4) If the amount of an annuity, payable quar-

terly for 5 years, at 12 per cent, be 4497. 5rs. what is the annuity?

(5) If an house be let upon lease for 8 months, and the amount for that time be 4093rs. 5as. 4p. at 8 per cent, what is the monthly rent?

(6) If a salary amounts to 707rs. 14as. in 7 months at $4\frac{1}{2}$ per cent, what is the salary?

CASE 3.—When U. A. and T. are given to find R.

Rule.

$$\frac{2a - 2ut}{utt - ut} = r.$$

(1) If an annuity of 700 rupees per annum amounts to 4340 rupees in 5 years, I demand the rate per cent?

(2) If a pension of 5600 rupees per annum, amounts to 50960 rupees in 7 years, what is the rate per cent?

Note. When the payments are half-yearly, then $4a - 4ut$ must be divided, when quarterly $8a - 8ut$ must be divided, and for monthly payments r must be divided as before.

(3) If an annuity of 700 rupees per annum, payable half-yearly, be forborn 5 years, amounts to 4445 rupees, I demand the rate per cent?

(4) If an annuity of 700 rupees per annum, payable quarterly, amounts to 4497rs. 8as. in 5 years, I demand the rate per cent?

(5) If an house be let upon lease for 8 months, at 500 rupees per month, and the amount for that time be 4093rs. 5as. 4p. what is the rate per cent?

(6) If a salary of 100 rupees per month, being forborn 7 months, amounts to 707rs. 14as. I demand the rate per cent?

CASE 4.—When U. A. and R. are given to find T.

Rule.

First, $\frac{2}{-} - 1 = x$

$$\text{Secondly, } \sqrt{\frac{2a}{x}} + \frac{xx}{4} : -\frac{1}{2}x = t.$$

(1) In what time will 700 rupees per annum amount to 4340 rupees, forborn at 12 per cent.

(2) In what time will a pension of 5600 rupees amount to 50960 rupees, at 10 per cent?

Note. If the payments are half yearly, then t . will be equal to the number of half years, or payments; but if they were to be made quarterly, then t . will be equal to the number of quarterly payments; when the payments are monthly, t . will be equal to the number of monthly payments.

(3) If an annuity of 700 rupees per annum, payable half-yearly, amounts to 4445 rupees on forbearance at 12 per cent, I demand the time, and payments forborn?

(4) If an annuity of 700 rupees per annum, payable quarterly, being forborn, amounts to 4497rs. 8as. at 12 per cent, I demand the time and payments forborn?

(5) If an house be let upon a lease for a certain time for 500 rupees per month, and the amount be 4093rs. 5as. 4p. at 8 per cent, I demand the time that it was let for?

(6). If a salary of 100 rupees per month, being forborn a certain time, amounts to 707rs. 14as. at $4\frac{1}{2}$ per cent, I demand the time of forbearance?

PRESENT WORTH OF ANNUITIES OR PENSIONS.

Note. P. represents the present worth U. T. and R. as in the last.

CASE 1.—When U. T. and R. are given to find P.

Rule.

$$\frac{rtt - rt + 2t}{2rt + 2} : \times u = p$$

(1) What is the present worth of 5000 rupees per annum to continue 6 years at 10 per cent?

(2) What is 800 rupees yearly rent, to continue 5 years, worth, in ready money, at 12 per cent?

(3) What is a salary of 4000 rupees per annum, to continue 7 years, worth, in ready money, at 8 per cent?

(4) What is a pension of 300 rupees per month, for 5 months, worth, in ready money, at $7\frac{1}{2}$ per cent?

Note. Observe the same note here, which is given in Case 1st. of annuities and pensions in arrears, concerning half-yearly, quarterly, and monthly payments.

(5) What is the present worth of 5000 rupees per annum, payable half-yearly, for 6 years, at 10 per cent per annum?

(6) What is the present worth of 5000 rupees per annum, for 6 years, payable quarterly, at 10 per cent?

CASE 2.—When *P. T.* and *R.* are given to find *U.*

Rule.

$$\frac{rt + 1}{rtt - rt + 2t} : \times 2p = u$$

(1) There is a lease of an house 6 years to come, I demand the yearly rent, when the present worth at 10 per cent is 23437rs. 8as.?

(2) What yearly rent is that, the present worth of which, for 5 years, is 3100 rupees, at 12 per cent?

(3) What salary is that, which for 7 years continuance, at 8 per cent, produces 22256rs. 6as. 4. 8p. for the present worth?

(4) If the present worth of a pension to continue 5 months at $7\frac{1}{2}$ per cent, be 1472rs. 11as. 2. 4p. I demand the pension?

Note. When the payments to be made are half yearly, you must multiply 4 *p.* but when they are quarterly, then multiply 8 *p.* to find *u.*

(5) There is a lease of an house payable half yearly for 6 years to come; I demand the yearly rent, when the present worth at 10 per cent is 23906rs. 4as.?

(6) There is a lease of an house payable quarterly for 6 years to come; I demand the yearly rent, when the present worth at 10 per cent is 24140rs. 10as.?

CASE 3.—When *U. P.* and *T.* are given to find *R.*

Rule.

$$\frac{ut - p \times 2}{2pt + ut - utt} = r$$

(1) I demand at what rate per cent will the yearly rent of 5000 rupees, to continue 6 years, produce the present worth of 23437rs. 8as?

(2) If the yearly rent of 800 rupees per annum to continue 5 years, bring 3100 rupees present worth, what is the rate per cent?

(3) If a salary of 4000 rupees per annum, to continue 7 years, produce 22256rs. 6as. 4. 8p. for the present worth, what is the rate per cent?

(4) If a pension of 300 rupees per month, to continue 5 months, produce 1472rs. 11as. 2. 4p. for the present worth, what is the rate per cent?

Note. When the annuities, &c. are to be paid half-yearly, or quarterly, then take the half or quarter of *u*, twice or four times the number of years, and the quotient will be the ratio of either half, or a quarter of the rate per cent.

(5) A lease of an house of 5000 rupees per annum, payable half-yearly, having 6 years to come, is sold for 23906rs. 4as. I demand the rate per cent?

(6) A lease of an house of 5000 rupees per annum, payable quarterly, having 6 years to come, is sold for 24140rs. 10as. I demand the rate per cent?

CASE 4.—When *U.* *P.* and *R.* are given to find *T.*
Rule.

$$\text{First, } \frac{2}{r} - \frac{2p}{u} - 1 = x$$

$$\text{Secondly, } \sqrt{\frac{2p}{ru} + \frac{x^2}{2}} = t.$$

(1) If 5000 rupees yearly rent, produce the present worth of 23437rs. 8as. at 10 per cent, what is the time of its continuance?

(2) I demand how long 800 rupees per annum may be purchased for 3100 rupees, at 12 per cent?

(3) How long must a salary of 4000 rupees per annum be enjoyed for 22256rs. 6as. 4.8p. at 8 per cent?

(4) What time may a pension of 300 rupees per month be bought for 1427rs. at $7\frac{1}{2}$ per cent.

Note. If the payments are half yearly, then *U.* will be half of the given lease, pension &c. and *R.* will be half the ratio, then *T.* required will be the number of payments; but if they are quarterly, then *U.* must be a fourth of the annuity, and *R.* a fourth of the ratio, which will make *T.* found, the number of quarterly payments or $\frac{1}{4}$ year.

(5) A lease of an house of 5000 rupees per annum, payable half yearly is sold for 23906rs. 4as. at 10 per cent. I demand the number of payments and the time to come?

(6) A lease of an house of 5000 rupees per annum, payable quarterly is sold for 2414rs. 10as. at 10 per cent, I demand the number of payments, and the time to come?

ANNUITIES TAKEN IN REVERSION.

CASE 1.—To find the present worth of an Annuity in Reversion.

Rule.

$$\frac{ttr - tr + 2t}{2tr + 2} xu = p$$

p. make *a.* then $\frac{a}{tr + 1}$

(1) What is the present worth of a lease of 300 rupees per month to continue 3 years; but is not to commence till the end of two years, allowing 9 per cent to the purchaser?

(2) I have the promise of a pension of 1000 rupees for 7 years: but it does not commence till the end of 4 years; yet as I am willing to dispose of the same for present payment at 5 per cent, I would know the present worth. What is it?

(3) A legacy of 2000 rupees per annum is left to a young man of 16 years of age for 8 years, the time of payment commencing at the year of perfection, viz. at his 21st year; but as he wants money, is desirous to dispose of the same, at 8 per cent. I wish to know the present worth?

(4) A good natured gentleman, to bestow a favour upon an unthankful wretch, settled upon him an income of 3600 rupees per annum for 12 years, to commence 5 years hence, but wanting money to carry on his extravagancies, he disposed of it at 10 per cent; how much should he receive for the present payment at that rate?

CASE 2.—To find the yearly income, &c. of an Annuity in Reversion.

Rule.

$$ptr + p = a$$

change *a* into *p.* then, $\frac{rt + 1}{rtt - 1t \times 2t} \times 2p = u$

(1) There is a lease of an house taken for 3 years; but not to commence till the end of 2; the lessee would sell the same for 8125rs. 9as. 8.94528p. pre-

sent payment, allowing 9 per cent to the purchaser. What is the monthly rent?

(2) A person having the promise of a pension for 7 years (which does not commence till the end of 4 years) has disposed of the same for 8447rs. 7. 0656as. present money, allowing 5 per cent to the purchaser, what was the pension?

(3) A person of 16 years of age wanting money, sold a legacy for 8919rs. 13rs. 9. 12p. allowing 8 per cent to the purchaser, as it was not to commence till the age of perfection. I demand the yearly rate?

(4) A person desirous of bestowing a favour on another, settled 12 years annuity upon him, to commence 5 years hence, at 10 per cent per annum for the time; but to carry on his extravagancies, he disposed of it for immediate payment for 20290rs. 14as. 6. 336p. allowing the purchaser 10 per cent, I demand the yearly rate.

SIMPLE INTEREST FOR DAYS.

To find the Simple Interest of any sum of money for any number of days.

Rule.

Multiply the interest of one rupee for one day, at the given rate, by the principal, and by the number of days, the last product is the interest required.

Note. The interest of one rupee for one day at .

1	} per cent is	.00002789726
2		.00005479452
3		.00008219178
4		.00010958904
5		.0001369863
6		.00016438356
7		.00019178082
8		.00021917808
9		.00024657534
10		.0002739726
11		.00030136986
12		.00032876712

(1) What is the interest of 1200 rupees for 126 days, at 8 per cent?

(2) What is the interest of 1260 rupees for 145 days, at 12 per cent?

(3) What is the interest of 10,000 rupees from the 1st of June 1787, to the 8th of March following, at 10 per cent?

(4) What is the interest of 2000 rupees from the 14th August 1787, to the 19th of December following, at 6 per cent?

(5) What is the interest of 500 rupees for 25 days, at 10 per cent?

(6) What is the interest of 400 rupees for 40 days, at 9 per cent?

REBATE OR DISCOUNT.

NOTE. S represents the sum to be discounted; P, the present worth of that sum,

T. the time before it is due,

R. the ratio or the rate per cent.

CASE 1.—When S. T. and R. are given to find P.

Rule.

$$\frac{S}{t r + 1} = p.$$

(1) What is the present worth of 795rs. 11as. 2p. for 11 months, at 12 per cent?

(2) What is the present worth of 1610rs. 10as. for 15 months, at 10 per cent?

(3) If a legacy of 10,000 rupees is left me the 24th of July 1787, to be paid on the Christmas day following, what must I receive, when I allow 9 per cent for present payment?

CASE 3.—When P. T. and R. are given to find S,

Rule.

$$p t r + p = s.$$

(1) Suppose I receive 716rs. 13as. 6.361152p. now, for a sum of money due 11 months hence, allowing 12 per cent for present payment, I demand the sum that was due at first?

(2) There is a certain debt payable 15 months hence; but I agree with the debtor to pay me down 1431rs. 10as. 6.72p. and allow him 10 per cent for present payment; I demand how much the debt is?

(3) A legacy was left me on the 24th of July 1807, to be paid on the Christmas-day following; but I agree with the executor, and allow him 9 per cent for the present payment of 9638rs. 8as. 11.47968p. I demand what the legacy was?

CASE 3.—When S. P. and R. are given to find T.

Rule.

$$\frac{s-p}{rp} = t$$

(1) The present worth of 795rs. 11as. 2p. due for a certain time to come, is 716rs. 13as. 6.361152p. at 12 per cent: I demand, in what time the first sum should have been paid, if no rebate had been made?

(2) There is 1610rs. 10as. due at a certain time to come; but I allow 10 per cent to the debtor for the present payment of 1431rs. 10as. 6.72p. I demand, when they should have been paid without any rebate?

(3) I have received 9638rs. 8as. 11.47968p. for a legacy of 10000 rupees, allowing the executor 9 per cent: I demand when the legacy was payable without rebate?

CASE 4.—When S. P. and T. are given to find R.

Rule.

$$\frac{s-p}{tp} = r$$

(1) At what rate per cent will 795rs. 11as. 2p.

payable 11 months hence, produce 716. 845361 rupees for present payment?

(2) At what rate per cent will 1610rs. 10as. payable 15 months hence, produce the present payment of 1431rs. 10as. 6.72p.?

(3) Suppose a legacy of 10000 rupees is left me the 24th of July 1808, to be paid on the Christmas-day following; but I agree with the executor for the present payment of 9638rs. 8as. 11.47968p. I demand the rate per cent allowed for his money?

EQUATION OF PAYMENTS.

Rule.

FIND the present worth of each payment for its respective time: thus,

$$\frac{S}{tr + 1} = p$$

Add all the present worths together, which sum, call P , then is $s - p = d$ the rebate.

$$\frac{d}{pr} = e, \text{ the true equated time.}$$

(1) A. owes B. 2000 rupees, to be paid as follows: viz. 1000 rupees at 2 months; and 1000 rupees at 4 months; but they agree to have but one payment of the whole, rebate being made at 6 per cent. I demand the true equated time?

(2) A merchant hath owing him 3000 rupees, to be paid as follows: 500 rupees at 2 months, 1000 rupees at 5 months, and the rest at 8 months, and it is agreed to have but one payment of the whole, rebate being made at 5 per cent. I demand the equated time?

(3) F. owes H. 1000 rupees, whereof 200 rupees is to be paid present, 400 rupees at 5 months, and the rest at 10 months; but they agree to have but

one payment of the whole, at the rate of 4 per cent rebate. I demand the true equated time?

(4) D. owes E. 8000 rupees, whereof 2000 rupees is to be paid in 3 months, 2000 rupees at 4 months, and 4000rs. at 6 months; but they agreeing to make but one payment of the whole at the rate of 5 per cent rebate; the true equated time is demanded?

(5) E. owes F. 1200 rupees, which is to be paid as follows: 200 rupees down, 500 rupees at the end of 10 months, and the rest at the end of 20 months; but they agree to have but one payment of the whole, rebate at 3 per cent, the true equated time is demanded?

COMPOUND INTEREST.

THE letters made use of in Compound Interest are,

A. The amount,

P. The principal,

T. The time,

R. The amount of 1 rupee for 1 year,

at any given rate, which is thus found:

As 100 ; 105. :: 1.05 As 100 ; 105.5 :: 1 = 1.055

A Table of the amount of 1 rupee for 1 year.

Rates per ct.	Amounts of 1 ru- pee.	Rates per ct.	Amounts of 1 ru- pee.
2	1.02	8	1.08
2½	1.025	8½	1.085
3	1.03	9	1.09
3½	1.035	9½	1.095
4	1.04	10	1.10
4½	1.045	10½	1.105
5	1.05	11	1.11
5½	1.055	11½	1.115
6	1.06	12	1.12
6½	1.065		
7	1.07		
7½	1.075		

CASE 1.—When P. T. R. are given to find A.

Rule.

$$p \times rt = a$$

Note. R. must be involved so many times as the number of years direct, and that will be rt .

(1) What sum will 4500 rupees amount to in four years time, at 5 per cent per annum?

(2) What will 4000 rupees amount to in 4 years, at 12 per cent per annum?

(3) What will 4800 rupees amount to in 5 years time, at 10 per cent per annum?

(4) What is the amount of 5000 rupees at $10\frac{1}{2}$ per cent, for 6 years?

CASE 2.—When A. R. and T. are given to find P.

Rule.

$$\frac{a}{rt} = p$$

(1) What principal must be put to interest to amount to the sum of 5209rs. 5as. in 3 years, at 5 per cent?

(2) What principal will amount to 6294rs. 1a. 2.86848p. in 4 years, at 12 per cent?

(3) What principal will amount to 7730rs. 7as. 2.016p. in 5 years, at 10 per cent?

(4) What principal will amount to 9102rs. 2as. 3.529309815p. in 6 years, at $10\frac{1}{2}$ per cent?

CASE 3.—When P. R. and A. are given to find T.

Rule.

$\frac{a}{p} = rt$, which must be continually divided by r , till nothing remains, and then the number of divisions will be t .

(1) In what time will 4500 rupees amount to 5209rs. 5as. at 5 per cent per annum?

(2) In what time will 4000 rupees amount to 6294rs. 1a. 2.86848p. at 12 per cent per annum?

(3) In what time will 4800 rupees amount to 7730rs. 7as. 2. 016p. at 10 per cent?

(4) In what time will 5000 rupees amount to 9102rs. 2as. 3.529309815p. at $10\frac{1}{2}$ per cent per annum?

CASE 4.—When P. A. and T. are given to find R,

Rule,

$\frac{a}{P} = rt$, which must be extracted by the rules of extraction, the time given in the question $= t$ shewing the power.

(1) At what rate per cent will 4500 rupees amount to 5209rs. 5as. in 3 years?

(2) At what rate per cent will 4000 rupees amount to 6294rs. 1a. 2.86848p. in 4 years?

(3) At what rate per cent will 4800 rupees amount to 7730rs. 7as. 2.016p. in 5 years?

(4) At what rate per cent will 5000 rupees amount to 9102rs. 2as. 3.529309815p. in 6 years?

ANNUITIES OR PENSIONS

IN ARREARS.

NOTE. U. represents the annuity, pension &c. T. R. and A. as before.

CASE 1.—When U. T. and R. are given to find A.

Rule.

$$\frac{urt - u}{r - 1} = a$$

(1) What will an annuity of 300 rupees per annum, payable yearly, amount to in 4 years, at 5 per cent?

(2) Suppose a pension of 5000 rupees per annum, payable yearly, be granted to a superannuated officer, what is the amount for 5 years forbearance at 8 per cent?

(3) If the monthly rent of a house, which is 400 rupees, be forborn 7 months at 6 per cent, what is the amount?

(4) If a salary of 4200 rupees per annum, to be paid monthly, be omitted for 6 months, at 12 per cent, what is the amount?

CASE 2.—When R. T. and A. are given to find U.
Rule.

$$\frac{ra - a}{rt - 1} = u$$

(1) What annuity being forborn for 4 years, will amount to 1293rs. 0as. 7.2p. at 5 per cent?

(2) If a pension, being forborn for 5 years at 8 per cent per annum, amount to 29333.0048 rupees, I demand how much it is per annum?

(3) If the monthly rent of an house, being forborn 7 months at 6 per cent, amount to 2842rs. 5as. 7.5370096812 p. I demand what is the rent?

(4) If the payment of a salary be omitted 6 months, I demand how much the salary is, when the amount is 2153rs. 3as. 3.41203872p. at 12 per cent,

CASE 3.—When U, A, and R, are given to find T.
Rule.

$$\frac{ar + u - a}{u} = rt, \text{ which must be repeatedly divided by } r, \text{ till nothing remains, and the number of divisions will be } = t.$$

(1) In what time will 300 rupees per annum, amount to 1293rs. 0as. 7.2p. allowing 5 per cent for the forbearance of payment?

(2) In what time will a pension of 5000 rupces per annum amount to 29333.0048 rupees at 8 per cent?

(3) In what time will the monthly rent of an house, being 400 rupees per month, amount to 2842rs. 5as. 7.5370096812p. at 6 per cent for non-payment?

(4) In what time will a salary of 4200 rupees per

annum, payable monthly, amount to 2153rs. 3as. 3.41203872p. at 12 per cent for the forbearance of payment?

PRESENT WORTH OF ANNUITIES, PENSIONS, &c.

Note. P. is the present worth, U. T. and R. as in the last.

CASE 1.—When U. T. and R. are given to find P.

Rule.

$$\frac{u}{r} \times \frac{1}{1 - \frac{r}{100}} = p$$

(1) What is the yearly rent of 200 rupees to continue 6 years, worth in ready money, at 5 per cent?

(2) What is the present worth of a pension of 300 rupees per annum for 5 years, at 8 per cent?

(3) What must be the discount of a lease of 500 rupees per annum, when the present payment is made for 4 years, at 12 per cent?

(4) A house is let upon lease for 4 months, at 700 rupees per month, and the lessee is desirous to make present payment, provided the lessor will allow him $8\frac{1}{4}$ per cent, I demand, how much must be paid down, and how much discounted?

CASE 2.—When P. T. and R. are given to find U.

Rule.

$$\frac{prt \times r}{rt - 1} = u$$

(1) What annuity or yearly rent, to continue 6 years, may be purchased for 1015rs. 2as. 2.57654p. at 5 per cent.

(2) Suppose the present payment of 1197rs. 13.00816as. was required for a pension for 5 years to come at 8 per cent, what is the pension?

(3) If the present payment of 1518.674673 rupees be made for the lease of an house for 4 years to come, at 12 per cent, what is the yearly rent?

(4) If a house is let upon lease for 4 months, and the lessee makes present payment of 2752.5288581 rupees for that time at $8\frac{1}{4}$ per cent, what is the yearly rent of that house?

CASE 3.—When U. P. and R. are given to find T.

Rule.

$\frac{u}{p + u - pr} = rt$, which being continually divided by r . till nothing remains, the number of those divisions will be $= t$.

(1) How long may a lease of 200 rupees yearly rent be had for 1015rs. 2as. 2.57538307008p. allowing 5 per cent to the purchaser?

(2) I demand what time a lease of 300 rupees per annum may be purchased for, when present payment of 1197rs. 13.00818as. is made at 8 per cent?

(3) If 1518.67467333rs. be paid down for a lease of 500rs. per annum, at 12 per cent, how long is the lease purchased for?

(4) A house is let upon lease for 700rs. per month, and the lessee makes payment of 2752.5288581 rupees, he being allowed $8\frac{1}{4}$ per cent, I demand how long the lease is purchased for?

OF ANNUITIES &c. TAKEN IN REVERSION.

To find the present worth of an annuity &c.

CASE 1.—U. T. and R. are given to find P.

Rule.

$$\frac{u \frac{u}{rt}}{r-1} = p$$

Call *P. a.* then *A. R.* and *T.* will be given to find *P.*

Rule.

$$\frac{a}{rt} = p$$

Note. To prove these questions exactly, the remainder after division must be taken in, where the respective operations answer each other in the following cases.

(1) What is the present worth of the reversion of a lease of 200 rupees per annum, to continue 6 years, but not to commence till the end of 2 years, allowing 5 per cent to the purchaser?

(2) There is a lease of certain lands worth 300 rupees per annum, which is yet in being for 3 years, and the lessee is desirous to take a lease in reversion for 5 years, to begin when the old lease shall be expired; I demand the present worth of the said lease in reversion, allowing 8 per cent to the purchaser?

(3) There is a house now building, which I have a mind to take a lease of, for 4 years; but will not be finished within 2 years; I demand how much I must pay down, when the yearly rent is 500 rupees, and the landlord affords me 12 per cent?

CASE 2.—To find the yearly income of an annuity &c.

Rule.

$$\begin{aligned} prt &= a \\ \hline \frac{prt \times r - prt}{rt - 1} &= u \end{aligned}$$

(1) What annuity or yearly rent, to be entered upon 2 years hence, and then to continue 4 years,

may be purchased for 920rs. 12as. 2.0094144p. ready money, at 5 per cent?

(2) There is a lease of certain lands in being for 3 years, and the lessee being minded to take a lease in reversion for 5 years, to begin when the old lease shall be expired, laid down 950rs. 13as. 9.12p. I demand the yearly rent of the said lands, when allowance was made to the lessee at 8 per cent?

(3) The present payment for the lease of an house is 1210rs. 10as. 10.176p. Now I have taken a lease in reversion for 4 years, which is to commence at the end of 2 years, I demand how much the yearly rent is, when for the said present payment I was allowed 12 per cent?

CASE 3.—To find the time.

Rule.

Change $\frac{prt = a}{u}$ a into p then $\frac{u}{p + u - pr} = rt$, which being continually divided by r . till nothing remains, the number of these divisions will be $= t$.

(1) The present worth of a certain lease in reversion is 920rs. 12as. 2.0094144p. The lease is 200 rupees per annum, and commences 2 years hence, and the allowance to the purchaser is 5 per cent, I demand the time of its continuance?

(2) A certain man took a lease of some lands for a time, which by agreement was not to commence till the expiration of 3 years; the yearly rent was 300 rupees: it was also agreed, that the purchaser should lay down 950rs. 13as. 9.12p. and be allowed for his present payment, 8 per cent, I demand the time, that the lease was taken for?

(3) The present payment for the lease of an house is 1210rs. 10as. 10.176p. and the yearly rent is 500 rupees. Now I have taken a lease in reversion, which is to commence at the end of 2 years, I de-

mand the length of the lease, when I was allowed 12 per cent ?

FREEHOLD ESTATES, OR SUCH AS CONTINUE FOR EVER.

Note. U. represents the yearly rent,
R. the amount of 1 rupee, &c. &c.
P. the present worth.

CASE 1.—When U. and R. are given to find P.

Rule.

$$\frac{u}{r-1} = p$$

(1) Suppose a freehold estate of 400 rupees per annum is to be sold, what is its worth, allowing the buyer 5 per cent for his money ?

(2) What is an estate of 2900 rupees per annum, to continue for ever, worth in present money, allowing 12 per cent to the purchaser ?

CASE 2.—When P. and R. are given to find U.

Rule.

$$p \times \overline{r-1} = u$$

(1) If a freehold estate is bought for 8000 rupees, and the allowance of 5 per cent is made to the buyer, I demand the yearly rent ?

(2) If an estate be sold for 24166rs. 10as. 7.99872p. present money, and 12 per cent is allowed to the buyer for the same, I demand the yearly rent ?

CASE 3.—When P. and U. are given to find R.

Rule.

$$\frac{p+u}{p} = r$$

(1) If a real estate of 400 rupees per annum be sold for 8000 rupees, I demand the rate per cent?

(2) If a freehold estate of 2900 rupees, be bought for 24166rs. 10as. 7.99872p. I demand the rate per cent allowed?

FREEHOLD ESTATES IN REVERSION.

CASE 1.—To find the present worth.

Rule.

$$\frac{u}{r - 1} = p$$

Let p . be changed into a .

then
$$\frac{a}{rt} = p.$$

(1) Suppose a freehold estate of 400 rupees per annum, to commence 3 years hence, is to be sold, what is it worth, allowing the purchaser 5 per cent for his present payment?

(2) What is an estate of 2900 rupees per annum, to continue for ever, but not to commence till the expiration of 2 years, worth, in present money, allowance being made at 12 per cent?

CASE 2.—To find the amount of the present worth.

Rule.

$$\frac{t}{pr} = a$$

Let a . be changed into p .

Then
$$\frac{pr \times r - pr}{r} = u$$

(1) Suppose a freehold estate, to commence 3 years hence, is sold for 6910rs. 11as. 2.4p. allowing

the purchaser 5 per cent, I demand the yearly income?

(2) There is a certain freehold estate bought for 19265rs. 8as. 3.5904p. which does not commence till the expiration of 2 years, the buyer was allowed 12 per cent for his money, I demand the yearly income?

REBATE OR DISCOUNT.

NOTE. In Rebate or Discount, the letters S. P. T. and R. are made use of, and denote,

S. the sum to be discounted for,

P. the present worth of that sum, due at any time to come,

T. the time before it becomes due, &c.

R. the amount of 1 rupee for 1 year, at any rate per cent.

CASE 1.—When S. T. and R. are given to find P.

Rule.

$$\frac{s}{r t} = p.$$

(1) What is the present worth of 463rs. 0a. 9.6p. payable 3 years hence, at 5 per cent?

(2) There is a debt of 635rs. 3as. 4.51104p. which is not due until 4 years hence; but is agreed to be paid in present money: what sum must the creditor receive, allowing the rebate of 9 per cent to the debtor for his money?

(3) If 896rs. 14as. 6.977777664p. be payable in 6 years time, what is the present worth, rebate being made at 12 per cent?

CASE 2.—When P. T. and R. are given to find S.

Rule.

$$p \times r t = s.$$

(1) If 400 rupees be received for a debt payable 3 years hence, and an allowance of 5 per cent was made to the debtor for his present payment, I demand what the debt was?

(2) There is a sum of money due at the expiration of 4 years, but the creditor agrees to take 450 rupees down, allowing 9 per cent on present payment, I demand what the debt is?

(3) If a sum of money due 6 years hence produces 500 rupees for present payment: rebate being made at 12 per cent, I demand how much the debt was?

CASE 3.—When S. P. and R. are given to find T.

Rule.

$\frac{s}{p} = rt$, which being continually divided by r , till nothing remains, the number of those divisions will be $= t$.

(1) A certain man received 400 rupees down for a debt of 463rs. 0a. 9.6p. rebate being made at 5 per cent, I demand when the debt is payable?

(2) There is a debt of 635rs. 3as. 4.651104p. payable at a certain time; but it is agreed to pay 450 rupees down, at the allowance of 9 per cent to the debtor for his present money, I demand in what time the debt would become due, if no such payment was to be made?

(3) The present payment of 500 rupees is made for a debt of 986rs. 14as. 6.977777664p. rebate at 12 per cent, I demand when the debt is payable?

CASE 4.—When S. P. and T. are given to find R.

Rule.

$\frac{s}{p} = rt$, which must be extracted by the rules of extraction, the time given in the question $= t$ shewing the power.

(1) The present worth of 463rs. 0a. 9.6p. pay-

able 3 years hence, is 400 rupees, I demand at what rate per cent rebate is made?

(2) A debt of 635rs. 3as 4.651104p. will be due 4 years hence, but it is agreed to take 450 rupees, what is the rate per cent, that the rebate is made at?

(3) The sum of 986rs. 14as. 6.977777664p. is payable in 6 years time, and the present payment of that sum is 500 rupees, I demand at what rate per cent must rebate be made to produce the said present worth?

ADDITIONAL QUESTIONS, FOR EXERCISE.

(1) **W**HAT number is that which being multiplied by 13, the product will be 221?

(2) If $\frac{1}{4}$ of a ship be worth 3740 rupees, what is the whole worth?

(3) What is the amount of 1000 rupees for 5 years at $4\frac{1}{2}$ per cent, simple interest?

(4) A young man received 210 rupees, which was $\frac{1}{3}$ of his elder brother's portion: now three times the elder brother's portion was half of his father's estate: I demand how much the estate was?

(5) If a tower be 384 feet high from the foundation, a sixth part under the earth, and an eighth part be under the water, how much in height is visible?

(6) A gentleman having 50° annas to pay among his coolies for a day's labour, would give some 6 pice, some 8 pice, and some 16 pice; the number in each class were equal. I demand the number of each?

(7) If 48 taken from 120 leaves 72, and 72 taken from 91 leaves 19, and 7 taken from thence leaves 12; what number is that, out of which when you have taken 48, 72, 19, and 7, leaves 12?

(8) What sum must be added to 1014206 to make it fifty millions?

(9) There are in 3 bags the sum of 1468 rupees, viz. in the first bag 461 rupees, in the second bag 581 rupees; I demand how much is in the third bag?

(10) What is the difference between twice 8 and 40, and twice 48?

(11) Will and Frank talking of their ages, in the year 1749, Will said he was born in the year of the rebellion (in 1715), and Frank said he remembered he was 10 years old, when King George the second was crowned (in the year 1727): required the age of each, and the difference of their ages?

(12) Six messmates, who propose to live well, during an East India voyage of 22 months, agree to spend among them 5 rupees per day, besides the ship's allowance: Now one of them having but 25 rupees a month, how will the matter stand with him at the end of the voyage?

(13) What number multiplied by 57 will produce just what 134 multiplied by 71 will do?

(14) A person dying left his widow 17800 rupees, and 12500 rupees to each of his four children, 50 gold mohurs a piece to 15 of his poor relations, and 1500 rupees in charities; he had been $25\frac{1}{2}$ years in trade, and at an average cleared 2260 rupees; what had he to begin with?

(15) The globe of the earth under the line is 360 degrees in circumference, each degree $69\frac{1}{2}$ miles; and this body turning on its own axis in 23 hours 56 minutes, at what rate, an hour are the inhabitants of Bencoolen situated under the line, carried about from west to east by this rotation?

(16) A fellow was saying, that when he told over his basket of mangoes 2 by 2, 3 by 3, 4 by 4, 5 by 5, or 6 by 6, there still came an odd one; but when he told them 7 by 7, they came even. How many were there?

(17) There are two numbers, whose product is 1610, the greater is given, 46; what is the sum of their squares, and what the cube of their difference?

(18) A lady had 9 children born 3 years after each

other; the eldest was born when she was 19 years old, what is now the age of the youngest, and how old is the lady?

(19) Suppose a ship sails $5\frac{1}{2}$ miles an hour for 14 days, how many degrees and minutes has she sailed in the whole, 60 sea miles making 1 degree?

(20) A. B. and C. trade in company. On making up accounts, it appears that A. and B. together gained 1310 rupees, B. and C. together 1212 rupees, and A. and C. together gained 1116 rupees, what did they severally gain?

(21) There is a mast or pole, 12 feet of which stands in the ground, 8 times that length in the water, and 9 times its length in the air, or above the water; I demand the whole length?

(22) A. and B. traded together, and gained 1000 rupees: A. put in 6400 rupees, B. put in so much that he must receive 600 rupees of the gain: I demand how much B. put in?

(23) What quantity of water must I add to a pipe of Madeira wine worth 336 rupees, to reduce the first cost to 7 rupees per dozen, supposing the pipe to contain 42 dozens?

(24) What difference is there between the interest of 500 rupees at 10 per cent for 12 years, and the discount of the same sum, at the same rate, and for the same time?

(25) If 12 mangoes are worth 21 rose-apples, and 3 rose-apples cost 1 pice, what is the price of 4 score and 4 mangoes?

(26) Three merchants, A. B. and C. have gained 234 rupees, which they are to divide so, that when the profit of A. is multiplied by 2, that of B's. by 3, and C.'s by 4, their products are to be equal, I demand how much each of them are to receive?

(27) There are two pieces of chintz, the one is 9 cubits shorter than the other, and cost 61 rupees, the other piece at the same price cost 72 rupees, I demand how many yards were in both pieces, and the price of one yard?

(28) A piece of satin cost a certain sum, and being sold for 70 rupees, there is lost $\frac{1}{4}$ in a rupee: I demand the first cost?

(29) With 13 gallons of Canary at 5 rupees a gallon, I mingled 20 gallons of white wine at 3rs. 12as. a gallon, and to these added 10 gallons of cyder at 2rs. 4as. per gallon, at what rate must I sell a quarter of this mixture so as to clear 10 per cent?

(30) A person having built a bridge over a certain nullah, is determined that for every elephant that crosses it, he will exact a toll of 8 pice, for every camel 4 pice, and every bullock 1 pice, all other cattle, &c. are to pass free; now at the year's end the chokeedar pays the proprietor 236rs. 15as. 8p. and tells him, that for 5 elephants passed 9 camels, and for every 3 camels 10 bullocks. Required the number of each?

(31) Ninety-eight artificers received among them as their hire for a certain job 256 sicca rupees, among whom were 20 riggers, 30 shipwrights, 24 blacksmiths, and 24 caulkers, which were divided thus, 4 riggers received as much as 5 shipwrights, 10 shipwrights as much as 16 blacksmiths, and 8 blacksmiths as much as 12 caulkers. Pray how much did those of each profession receive?

(32) A. and B. clear by an adventure to sea 50 gold-mohurs, their stocks were as 13 to 10, and they gained 45 per cent. I demand their respective stocks?

(33) A. and B. in partnership equally divide the gain; A.'s money, which was 4000 rupees, lay for 19 months, B.'s for no more than 7, the adventure of the latter is sought.

(34) In a certain school $\frac{1}{4}$ of the boys study Latin, $\frac{1}{3}$ study grammar, $\frac{1}{5}$ study accounts, and $\frac{1}{6}$ learn to write, and 9 to read; how many are there of each class, and what is the strength of the school?

(35) There are 7 chests of drawers, in each of which there are 18 drawers, and in each of these are 6 divisions, in each of which are three gold-mohurs, how many rupees are there in the whole?

(36) A. and B. venturing equal sums of money, clear by joint trade 1540 rupees, by agreement A. was to have 8 per cent, because he spent time in the execution of the profit, and B. was only to have 5. The question is, what was allotted to A. for his trouble?

(37) A man dies and leaves a legacy of 9000 rupees to be disposed of among his relations, viz. A. B. C. and D. which legacy is to be disposed of in this order: B. is to have twice as much as A. C. thrice as much as B. and D. is to have as much and $\frac{1}{2}$ as much as C. what must each person have?

(38) Two merchants, A. and B. are in company, the sum of their stocks is 3000 rupees, the money of A. continuing 9 months, and that of B. 11 months, they divide their gain equally. The question is how much each man put in?

(39) The continual multiplication of the 9 digits will give the number of changes, that may be rung on 9 bells, as well as of any other combination; how many are there?

(40) Supposing that for a month's rent I paid in money 205rs. 8as. 4p. and was allowed for a small repair 107rs. 9as. 5p. and for the taxes 36rs. 14as. 3p. what did my Landlord go at per month and year?

(41) There are two numbers, 75 is the less, to which the greater is in proportion as 8 to 5, what is the sum and the product of their sum and difference, the difference and product of their squares, and the sum of the squares of their 2 quotes, the greater divided by the less, and the less again by the greater?

(42) A piece of ground measures 368 ft. $7\frac{1}{2}$ in. by 9 ft. $4\frac{3}{4}$ in. required the contents in feet?

(43) A person was possessed of $\frac{3}{4}$ share of a salt-work, and sold $\frac{2}{3}$ of his interest therein for 17100 rupees, what was the value of the whole property at the same rate?

(44) A. and B. join stocks, and purchase brandies. A.'s stock was 200 rupees more than that of B. now by selling out their commodity at 50 rupees per

hogshead A. cleared 100 rupees and B. 80 rupees; the quantity of brandy dealt for is required, as also the gain upon the hogshead?

(45) In an article of trade A. gains 145 rupees, and his adventure was 350 rupees more than B.'s whose share of the profit is but 85 rupees, what are their respective stocks?

(46) In 147 times 568 pagodas how many current rupees, exchange at 345 Arcot rupees per 100 star pagodas?

(47) Lent 1000 rupees at 10 per cent, which by the 18th November 1809 was raised to half as many again and 95 more; pray what day did the bond bear date?

(48) An officer's pay and batta is 500 Sonaut rupees per month, how much is that per diem, and per annum, in sicca rupees?

(49) A. for a nine months adventure received 250 rupees, B. for one of 7 months received 23 gold mohurs and 7 rupees over, and C. for laying out of his contribution 5 months had a title to 500 rupees. The total of their adventures multiplied into their respective times is 6500 rupees; what were their particular stocks?

(50) Bought seven pipes of wine at 300 ct. rupees per pipe, which I sell again at 350 sicca rupees per pipe; what is the whole gain, and how much per cent?

(51) Suppose I would exchange 100 gold mohurs for rupees, half rupees and quarter rupees, and would have $\frac{1}{4}$ in sicca rupees, $\frac{1}{8}$ in half rupees, and $\frac{1}{16}$ in quarter rupees, how many pieces of each sort should I receive in exchange?

(52) Having a piece of ground 127 cottahs in front, let off to A. 57 cottahs to build on at one end, and to B. at first $35\frac{1}{2}$ cottahs, which he afterwards by consent extended to 42 cottahs; what ground was left me in the centre?

(53) Suppose I would exchange 100 gold-mohurs for rupees, half rupees and quarter rupees, and would

have for every two rupees, five half rupees, and for every 4 rupees 14 quarter rupees, how many pieces of each sort should I receive?

(54) If three dozen pair of Cossimbazar stockings be equal in value to 2 pieces of Madras izarees, 3 pieces of Madras izarees to 7 dozen cubits of China grass-cloth, 6 dozen cubits of China grass-cloth to 2 pieces of cossaes, and 3 pieces of cossaes to 81 rupees, how many dozen of stockings may be bought for 28 rupees?

(55) A minor of 14 had an annuity left him of 1200 rupees, the proceeds of which, by will, was to be put out both principal and interest yearly, as it fell due, at 10 per cent, until he should arrive at 21 years of age: the utmost improvement being thus made upon this part of his fortune, what had he then to receive?

(56) A merchant, through God's blessing and his own industry, in ten years time found himself worth 130000 rupees. From his books it appeared that the last 3 years he had cleared 8730 rupees per annum, the three preceding but 5860 rupees per annum, and the four before that but 3640 rupees per annum; I demand what sum of money he set out with, and the state of his fortune at the end of every year, during the time he continued in business?

(57) In order to raise a joint stock of 10000 rupees A. B. and C. together subscribe 8500 rupees and D. the rest; now B. and C. together subscribed 6050 rupees, and C. told a person he had subscribed 420 rupees more than B. pray what sum did each of them set their hands to?

(58) A rice gholah was robbed three nights successively, the first night half the bags were stolen, and half a bag more, the second night half of the remainder was lost, and half a bag more, the last night, they took half what were left, and half a bag more, by which time they were reduced to 20. How many were there at first?

(59) A sircar has been out with bills, and gives an

account, that A. paid him 225 s. rs. B. 17 gold-mohurs and 5 s. rs. C. 115rs. 10 a. sonaut, D. a bank note of 200 s. rs. E. 85 rupees, 12 half rupees, and 1 rupee in pice, F. a one hundred rupee note, 4 gold mohurs, and a half, and G. 400 arcot rs. how many rupees sicca had he in his charge?

(60) I would put 60 hogsheads of porter into 30 wine pipes, and would know, what the cask must hold that receives the difference, 231 solid inches being the gallon of wine, and 282 that of beer?

(61) Five hundred bars of iron, every ten of which weighed avoirdupois weight, 4 cwt. 75 lbs. bought in London at 9 shils. and 6 pence, per cwt. is sold in Calcutta at 78 s. rs. per bazar maund, required the bazar weight, amount sale, whole profit, and profit per cent? when in exchange the current rupee was valued at 2 shils. 3 pence.

(62) How long would a crore of crores of rupees be in counting supposing 100 rupees to be counted every minute without intermission, and the year to consist of 365 days 6 hours?

(63) In a series of proportional numbers, the first is 5, the third 8, the product of the second and third 78.4, what is the difference of the second and fourth?

(64) What difference is there between the interest of 500 rupees at 5 per cent per annum, for 12 years, and the discount of the same sum, at the same rate for the same time?

(65) If $\frac{1}{4}$ of $\frac{1}{4}$ of $\frac{7}{8}$ of a ship be worth $\frac{1}{4}$ of $\frac{1}{4}$ of $\frac{1}{4}$ of her cargo, valued at 1 lack and twenty thousand rupees, what did my share of ship and cargo stand me in, who am half owner?

(66) A regiment of sepoys, consisting of 976 men, are to be new cloathed, each coat to contain $2\frac{1}{2}$ yards of cloth that is $\frac{1}{3}$ yards wide, and lined with shalloon each $\frac{1}{2}$ yards wide, how many yards of shalloon will line them?

(67) A wild young fellow in a short time out-ran $\frac{1}{4}$ of his fortune, when his friends advised him to a plan, which drew from him 2200 rupees, he still con-

tinued his extravagance till he had no more left than 924 rupees, which he found by computation was just $\frac{1}{2}$ of his property after he had laid out the above 2200 rupees: pray what was his fortune at first?

(68) I want the length of a shoal, that being to stand 11 feet from the level of a ship's side will support a jamb 23 feet 10 inches from the ground?

(69) X. Y. Z. working together, can complete a job in 12 days, Z. alone can do it in 24 days, X. in 34 days, in what time can Y. get it done himself?

(70) In distress at sea, they throw out 17 bales of cotton value 340 rupees per bale, the worth of which came up to be but $\frac{1}{2}$ of the indigo they cast over board, besides which, they threw out 13 iron guns worth 180rs. 8as. a piece, the value of all these amounted to $\frac{1}{2}$ of $\frac{1}{2}$ of the ship and lading, pray what of this value came into port?

(71) A cooper having a 60 gallon cask full of liquor with 3 cocks to it, one of which would empty it in 1 hour, another in twice the time, and the other in 3 hours, he for the sake of dispatch set them all running together, in what time will it be empty?

(72) A boy being asked how many scholars his master had, replied, if there were as many, $\frac{1}{2}$ as many, and $\frac{1}{4}$ as many, there would be 154; how many had he?

(73) A. B. and C. join in company, and put in together 3822 rupees. A.'s money was in 3 months, B.'s money was in 5 months, and C.'s was in 7 months; they gained 234 rupees, which was so divided that $\frac{1}{2}$ of A.'s gain was equal to $\frac{1}{3}$ of B.'s; and $\frac{1}{3}$ of B.'s to $\frac{1}{4}$ of C.'s, what did each gain and put in?

(74) Divide 1000 gold-mohurs; give A. 129 more than B. and B. 178 less than C.

(75) A. with intention to clear 30 gold mohurs on a bargain with B. rates China dhammur at 3 rupees the seer that stood him in 2rs. 8as. B. apprized of that, set down malt which cost him 5 rupees per maund at an adequate price: how much mortal did they contract for?

(76) A. in order to put off to B. 720 cubits of damaged muslin worth 3rs. 2as. a cubit at 5rs. 4p. proposes; in case he has $\frac{1}{2}$ the value in money to give B. a discount of ten per cent, the rest A. is to take out in Chittagong canvas. B. apprized of the whole management, rates in justice at 9 rupees a bolt; pray what was it really worth in ready money, and what quantity of canvas was B. to deliver to A.?

(77) A young jackall starts 82 5 feet before a greyhound, and is not perceived by him till she has been up 34 seconds; she scuds away at the rate of 12 miles an hour, and the dog in view makes after her at the rate of 20; how long will the course hold, and what ground will be ran, beginning with the outsetting of the dog?

(78) A. leaves a place distant 130 coss from Calcutta, at 10 o'clock in the morning for Calcutta, and goes at the rate of 2 coss an hour without intermission, B. sets out from Calcutta for that place at 6 the same evening, and travels 3 coss an hour constantly; the question is whereabouts on the road will they meet?

(79) A reservoir for water has two cocks to supply it, by the first it may be filled in 44 minutes, by the second in just an hour; and it hath a discharging cock, by which it may when full be emptied in half an hour; now suppose these 3 cocks by accident should all of them be left open, and the water should chance to come in, what time would this cistern be in filling?

(80) A. sets out from Calcutta for a place at the very time that B. set out from that place to Calcutta, distant 100 coss; at 8 hours end they met on the road, and it then appeared that A. had ridden $2\frac{1}{2}$ coss an hour more than B. at what rate an hour did each of them travel?

(81) A minor of 12 years of age was left an estate of 1500rs. per annum, his guardian was allowed by his father's will 200 rupees per annum for his board, education, and other contingent charges, and was to

put out the surplus to interest for his benefit at 12 per cent simple interest, now supposing no loss of principal or interest, what sum had his guardian to pay him, when he was of age?

(82) Five merchants, viz. A. B. C. D. and E. have gained 20250 rupees, which they divide in such a manner that $\frac{1}{2}$ of the share of A. is equal severally to $\frac{1}{4}$ of the share of B. $\frac{1}{3}$ of C. $\frac{1}{5}$ of D. and $\frac{1}{6}$ of E. The question is how much did each man share?

(83) If 100 rupees being put forth for interest at a certain rate will at the end of 3 years be augmented to 115.7625 (compound interest or interest upon interest computed) what principal and interest will be due at the first year's end?

(84) An accomptant told a gentleman who had constantly 8 persons at his table, that he would gladly make a ninth, and was willing to give 210 rupees for his board so long as he could place the said company at dinner differently from any one day before; this being accepted, what did his entertainment cost him in a year?

(85) Three persons enter into joint trade together, to which A. contributed 210 rupees, B. 312 rupees, they clear 140 rupees, whereof 37rs. 8as. belongs of right to C. that person's stock, and the several gains of the other two are required?

(86) A. B. and C. will trench a field in 12 days, B. C. and D. in 14, C. D. and A. in 15, and D. A. and B. in 18; in what time will it be done by all of them together, and by each of them singly?

(87) If during the tide of ebb a paunchway sets out from Calcutta southward, and at the same instant a boat leaves one of the Indiamen in Diamond Harbour for Calcutta, allowing the distance to be 34 coss, the stream forwards, and retards the other $2\frac{1}{2}$ coss per hour, the boats are equally laden, the rowers equally good, and at the ordinary rate of rowing in slack water would proceed at the rate of 5 coss per hour: where in the river would the two boats meet?

(88) A gay young fellow had 18200 rupees left him by an old uncle, to whose memory he expended 3 per cent of his whole fortune, in a sumptuous funeral, and monument; 9 per cent of the remainder he made a present to his cousins forgotten by the old man; with $\frac{7}{8}$ of the remainder he bought a house, and with $\frac{1}{8}$ of the residue a carriage and horses: he squandered 550 rupees in gaming, and after having lived at the rate of 2000 rupees a year for 19 months, and ruined his health, he died: what was there left for his sister, who was heir at law?

(89) Three persons purchased a snow, towards the payment whereof A. advanced $\frac{1}{2}$, B. $\frac{1}{3}$, and C. 1400 rupees: how much paid A. and B. and what part of the vessel had C.?

(90) A Nabob sent his three wives a number of pearls, to be divided equally amongst them. Required how many there were, when a third, sixth and ninth made just 2200 pearls?

Table I.

*Of Interest of any Sum of Money, of any Specie,
from 1 Day to 10 Years, at 8 per Cent
per Annum.*

Days.	Decimal Parts.	Days.	Decimal Parts.	Days.	Decimal Parts.	Days.	Decimal Parts.
1	0002192	41	0089863	81	0177534	121	0265206
2	0004383	42	0092054	82	0179726	122	0267397
3	0006575	43	0094246	83	0181918	123	0269589
4	0008767	44	0096439	84	0184109	124	0271781
5	0010959	45	0098630	85	0186301	125	0273972
6	0013150	46	0100822	86	0188493	126	0276164
7	0015342	47	0103013	87	0190685	127	0278356
8	0017534	48	0105205	88	0192877	128	0280548
9	0019726	49	0107397	89	0195068	129	0282740
10	0021918	50	0109589	90	0197260	130	0284931
11	0024109	51	0111781	91	0199452	131	0287123
12	0026301	52	0113972	92	0201644	132	0289315
13	0028493	53	0116164	93	0203835	133	0291507
14	0030685	54	0118356	94	0206027	134	0293698
15	0032877	55	0120548	95	0208219	135	0295890
16	0035068	56	0122740	96	0210411	136	0298082
17	0037260	57	0124931	97	0212603	137	0300274
18	0039452	58	0127123	98	0214794	138	0302466
19	0041643	59	0129315	99	0216986	139	0304657
20	0043835	60	0131507	100	0219178	140	0306849
21	0046027	61	0133698	101	0221370	141	0309041
22	0048219	62	0135890	102	0223561	142	0311233
23	0050411	63	0138082	103	0225753	143	0313424
24	0052602	64	0140274	104	0227945	144	0315616
25	0054794	65	0142466	105	0230137	145	0317808
26	0056986	66	0144657	106	0232329	146	0319999
27	0059178	67	0146849	107	0234520	147	0322192
28	0061370	68	0149041	108	0236712	148	0324383
29	0063561	69	0151233	109	0238904	149	0326575
30	0065753	70	0153424	110	0241096	150	0328767
31	0067945	71	0155616	111	0243287	151	0330959
32	0070137	72	0157808	112	0245479	152	0333150
33	0072329	73	0159999	113	0247671	153	0335342
34	0074520	74	0162192	114	0249863	154	0337534
35	0076712	75	0164383	115	0252055	155	0339726
36	0078904	76	0166575	116	0254246	156	0341918
37	0081095	77	0168767	117	0256438	157	0344109
38	0083288	78	0170959	118	0258630	158	0346301
39	0085480	79	0173150	119	0260822	159	0348493
40	0087671	80	0175342	120	0263013	160	0350686

Table I.

*Of Interest of any Sum of Money, of any Specie,
from 1 Day to 10 Years, at 8 per Cent
per Annum.*

Days.	Decimal Parts.	Days.	Decimal Parts.	Days.	Decimal Parts.	Days.	Decimal Parts.
161	0352877	201	0440548	241	0526219	281	0615890
162	0355068	202	0442740	242	0530410	282	0618082
163	0357260	203	0444931	243	0532602	283	0620274
164	0359452	204	0447123	244	0534794	284	0622466
165	0361644	205	0449315	245	0536986	285	0624657
166	0363835	206	0451507	246	0539178	286	0626849
167	0366027	207	0453698	247	0541379	287	0629041
168	0368219	208	0455890	248	0543561	288	0631233
169	0370411	209	0458082	249	0545753	289	0633424
170	0372603	210	0460274	250	0547945	290	0635616
171	0374794	211	0462466	251	0550136	291	0637808
172	0376986	212	0464657	252	0552328	292	0640000
173	0379178	213	0466850	253	0554520	293	0642192
174	0381370	214	0469041	254	0556712	294	0644383
175	0383561	215	0471233	255	0558904	295	0646575
176	0385753	216	0473424	256	0561095	296	0648767
177	0387945	217	0475616	257	0563287	297	0650959
178	0390137	218	0477808	258	0565479	298	0653150
179	0392329	219	0479999	259	0567671	299	0655342
180	0394520	220	0482192	260	0569863	300	0657534
181	0396712	221	0484383	261	0572054	301	0659726
182	0398904	222	0486575	262	0574246	302	0661918
183	0401095	223	0488767	263	0576438	303	0664109
184	0403287	224	0490959	264	0578630	304	0666301
185	0405479	225	0493150	265	0580821	305	0668492
186	0407671	226	0495342	266	0583013	306	0670685
187	0409863	227	0497534	267	0585205	307	0672877
188	0412055	228	0499726	268	0587397	308	0675068
189	0414244	229	0501918	269	0589589	309	0677260
190	0416438	230	0504109	270	0591780	310	0679452
191	0418630	231	0506301	271	0593972	311	0681644
192	0420822	232	0508493	272	0596164	312	0683836
193	0423013	233	0510685	273	0598356	313	0686027
194	0425205	234	0512877	274	0600547	314	0688219
195	0427397	235	0515068	275	0602739	315	0690411
196	0429589	236	0517259	276	0604931	316	0692603
197	0431781	237	0519452	277	0607123	317	0694794
198	0433972	238	0521644	278	0609315	318	0696986
199	0436164	239	0523835	279	0611506	319	0699178
200	0438356	240	0526027	280	0613698	320	0701370

Table II.

*Of Interest of any Sum of Money, of any Specie,
from 1 Day to 10 Years, at 10 per Cent
per Annum.*

Days.	Decimal Parts.	Days.	Decimal Parts.	Days.	Decimal Parts.	Days.	Decimal Parts.
1	0002740	41	0112329	81	0221918	121	0331507
2	0005479	42	0115068	82	0224657	122	0334246
3	0008219	43	0117808	83	0227397	123	0336986
4	0010959	44	0120548	84	0230137	124	0339726
5	0013698	45	0123287	85	0232876	125	0342466
6	0016438	46	0126027	86	0235616	126	0345206
7	0019178	47	0128767	87	0238356	127	0347945
8	0021918	48	0131507	88	0241096	128	0350685
9	0024657	49	0134246	89	0243835	129	0353424
10	0027397	50	0136986	90	0246575	130	0356164
11	0030137	51	0139726	91	0249315	131	0358904
12	0032877	52	0142466	92	0252055	132	0361644
13	0035616	53	0145205	93	0254794	133	0364383
14	0038356	54	0147945	94	0257534	134	0367123
15	0041096	55	0150685	95	0260274	135	0369863
16	0043835	56	0153424	96	0263013	136	0372603
17	0046575	57	0156164	97	0265753	137	0375342
18	0049315	58	0158904	98	0268493	138	0378082
19	0052055	59	0161644	99	0271232	139	0380822
20	0054794	60	0164383	100	0273972	140	0383561
21	0057534	61	0167123	101	0276712	141	0386301
22	0060274	62	0169863	102	0279452	142	0389041
23	0063013	63	0172603	103	0282192	143	0391781
24	0065753	64	0175342	104	0284931	144	0394520
25	0068493	65	0178082	105	0287671	145	0397260
26	0071233	66	0180822	106	0290411	146	0399999
27	0073972	67	0183561	107	0293150	147	0402749
28	0076712	68	0186301	108	0295890	148	0405479
29	0079452	69	0189041	109	0298630	149	0408219
30	0082192	70	0191781	110	0301370	150	0410959
31	0084931	71	0194520	111	0304109	151	0413698
32	0087671	72	0197260	112	0306849	152	0416438
33	0090411	73	0199999	113	0309589	153	0419178
34	0093150	74	0202740	114	0312329	154	0421918
35	0095890	75	0205480	115	0315068	155	0424657
36	0098630	76	0208220	116	0317808	156	0427397
37	0101370	77	0210959	117	0320548	157	0430137
38	0104110	78	0213699	118	0323287	158	0432876
39	0106850	79	0216439	119	0326027	159	0435616
40	0109590	80	0219178	120	0328767	160	0438356

Table II.

*Of Interest of any Sum of Money, of any Specie,
from 1 Day to 10 Years, at 10 per Cent
per Annum.*

Days.	Decimal Parts.	Days.	Decimal Parts.	Days.	Decimal Parts.	Days.	Decimal Parts.
161	0441096	201	0550683	241	0660274	281	0769865
162	0443835	202	0553424	242	0663013	282	0772603
163	0446575	203	0556164	243	0665753	283	0775342
164	0449315	204	0558904	244	0668493	284	0778082
165	0452055	205	0561644	245	0671233	285	0780822
166	0454794	206	0564383	246	0673972	286	0783561
167	0457534	207	0567123	247	0676711	287	0786301
168	0460274	208	0569863	248	0679451	288	0789041
169	0463013	209	0572603	249	0682195	289	0791781
170	0465753	210	0575342	250	0684931	290	0794520
171	0468493	211	0578082	251	0687671	291	0797260
172	0471233	212	0580822	252	0690411	292	0799999
173	0473972	213	0583561	253	0693150	293	0802740
174	0476712	214	0586301	254	0695890	294	0805479
175	0479452	215	0589041	255	0698630	295	0808219
176	0482191	216	0591781	256	0701370	296	0810950
177	0484931	217	0594520	257	0704109	297	0813698
178	0487671	218	0597260	258	0706849	298	0816438
179	0490410	219	0599999	259	0709589	299	0819178
180	0493150	220	0602740	260	0712329	300	0821918
181	0495890	221	0605479	261	0715068	301	0824657
182	0498630	222	0608219	262	0717808	302	0827397
183	0501370	223	0610959	263	0720548	303	0830137
184	0504109	224	0613698	264	0723287	304	0832878
185	0506849	225	0616438	265	0726027	305	0835618
186	0509589	226	0619178	266	0728767	306	0838356
187	0512329	227	0621918	267	0731507	307	0841096
188	0515068	228	0624657	268	0734246	308	0843835
189	0517808	229	0627387	269	0736986	309	0846575
190	0520548	230	0630137	270	0739726	310	0849315
191	0523287	231	0632877	271	0742466	311	0852055
192	0526027	232	0635616	272	0745205	312	0854794
193	0528767	233	0638356	273	0747945	313	0857534
194	0531507	234	0641096	274	0750685	314	0860274
195	0534246	235	0643835	275	0753424	315	0863013
196	0536986	236	0646575	276	0756164	316	0865753
197	0539726	237	0649315	277	0758904	317	0868493
198	0542466	238	0652055	278	0761644	318	0871233
199	0545205	239	0654794	279	0764383	319	0873972
200	0547945	240	0657534	280	0767123	320	0876712

Table III.

*Of Interest of any Sum of Money, of any Specie,
from 1 Day to 10 Years, at 12 per Cent
per Annum.*

Days.	Decimal Parts.	Days.	Decimal Parts.	Days.	Decimal Parts.	Days.	Decimal Parts.
1	0003287	41	0134794	81	0266301	121	04097908
2	0006575	42	0138082	82	0269589	122	04130796
3	0009863	43	0141370	83	0272877	123	04163683
4	0013150	44	0144657	84	0276164	124	04196571
5	0016438	45	0147945	85	0279452	125	04229459
6	0019726	46	0151233	86	0282740	126	04262346
7	0023013	47	0154520	87	0286027	127	04295234
8	0026301	48	0157808	88	0289315	128	04328122
9	0029589	49	0161096	89	0292603	129	04361009
10	0032877	50	0164383	90	0295890	130	04393897
11	0036164	51	0167671	91	0299178	131	04426785
12	0039452	52	0170959	92	0302466	132	04459672
13	0042740	53	0174246	93	0305753	133	04492560
14	0046027	54	0177534	94	0309041	134	04525449
15	0049315	55	0180822	95	0312329	135	04558335
16	0052603	56	0184109	96	0315616	136	04591223
17	0055890	57	0187397	97	0318904	137	04624111
18	0059178	58	0190685	98	0322192	138	04656998
19	0062466	59	0193972	99	0325479	139	04689886
20	0065753	60	0197260	100	0328767	140	04722774
21	0069041	61	0200548	101	0332055	141	04755661
22	0072329	62	0203835	102	0335342	142	04788549
23	0075616	63	0207123	103	0338630	143	04821437
24	0078904	64	0210410	104	0341918	144	04854324
25	0082192	65	0213698	105	0345205	145	04887212
26	0085479	66	0216986	106	0348493	146	04920099
27	0088767	67	0220274	107	0351781	147	04952987
28	0092055	68	0223561	108	0355069	148	04985875
29	0095342	69	0226849	109	0358356	149	05018763
30	0098630	70	0230137	110	0361644	150	05051650
31	0101918	71	0233424	111	0364931	151	05084538
32	0105205	72	0236712	112	0368219	152	05117426
33	0108493	73	0239999	113	0371507	153	05150313
34	0111781	74	0243287	114	0374794	154	05183201
35	0115068	75	0246575	115	0378082	155	05216089
36	0118356	76	0249863	116	0381370	156	05248977
37	0121644	77	0253150	117	0384657	157	05281864
38	0124931	78	0256438	118	0387945	158	05314752
39	0128219	79	0259726	119	0391233	159	05347640
40	0131507	80	0263013	120	0394521	160	05380527

Table III.

*Of Interest of any Sum of Money, of any Specie,
from 1 Day to 10 Years, at 12 per Cent
per Annum.*

Days.	Decimal Parts.	Days.	Decimal Parts.	Days.	Decimal Parts.	Days.	Decimal Parts.
161	0529315	201	0660822	241	0792328	281	0923845
162	0532603	202	0664109	242	0795616	282	0927123
163	0535890	203	0667397	243	0798904	283	0930411
164	0539178	204	0670685	244	0802192	284	0933698
165	0542466	205	0673972	245	0805479	285	0936986
166	0545754	206	0677260	246	0808767	286	0940274
167	0549041	207	0680548	247	0812055	287	0943561
168	0552329	208	0683835	248	0815342	288	0946849
169	0555616	209	0687123	249	0818630	289	0950137
170	0558904	210	0690411	250	0821918	290	0953424
171	0562192	211	0693698	251	0825205	291	0956712
172	0565479	212	0696986	252	0828493	292	0959999
173	0568767	213	0700274	253	0831781	293	0963287
174	0572054	214	0703561	254	0835068	294	0966575
175	0575342	215	0706849	255	0838356	295	0969863
176	0578630	216	0710137	256	0841644	296	0973150
177	0581918	217	0713424	257	0844931	297	0976438
178	0585205	218	0716712	258	0848219	298	0979726
179	0588493	219	0719999	259	0851507	299	0983013
180	0591781	220	0723287	260	0854794	300	0986301
181	0595068	221	0726575	261	0858082	301	0989589
182	0598356	222	0729863	262	0861370	302	0992877
183	0601644	223	0733150	263	0864657	303	0996164
184	0604931	224	0736438	264	0867945	304	0999452
185	0608219	225	0739726	265	0871233	305	1002740
186	0611507	226	0743013	266	0874520	306	1006027
187	0614794	227	0746301	267	0877808	307	1009315
188	0618082	228	0749589	268	0881096	308	1012603
189	0621370	229	0752877	269	0884383	309	1015890
190	0624657	230	0756164	270	0887671	310	1019178
191	0627945	231	0759452	271	0890959	311	1022465
192	0631233	232	0762740	272	0894246	312	1025753
193	0634520	233	0766027	273	0897534	313	1029041
194	0637808	234	0769315	274	0900822	314	1032329
195	0641096	235	0772603	275	0904109	315	1035616
196	0644383	236	0775890	276	0907397	316	1038904
197	0647671	237	0779178	277	0910685	317	1042192
198	0650959	238	0782466	278	0913972	318	1045479
199	0654246	239	0785753	279	0917260	319	1048767
200	0657534	240	0789041	280	0920548	320	1052055

Table III.

*Of Interest of any Sum of Money, of any Specie,
from 1 Day to 10 Years, at 12 per Cent
per Annum.*

Days.	Decimal Parts.	Days.	Decimal Parts.	Days.	Decimal Parts.	Days.	Decimal Parts.
321	1055342	341	1121096	361	1186849	10	10
322	1058630	342	1124383	362	1190137	11	11
323	1061918	343	1127671	363	1193424	12	12
324	1065205	344	1130959	364	1196712		
325	1068493	345	1134246	365	1200000		
326	1071781	346	1137534	Months.		Years.	
327	1075068	347	1140822				
328	1078356	348	1144109				
329	1081644	349	1147397				
330	1084931	350	1150685				
331	1088219	351	1153972				
332	1091507	352	1157260				
333	1094794	353	1160548				
334	1098082	354	1163835				
335	1101370	355	1167123				
336	1104657	356	1170411	1	01		1 12
337	1107945	357	1173698	2	02		2 24
338	1111233	358	1176986	3	03		3 36
339	1114520	359	1180274	4	04		4 48
340	1117808	360	1183561	5	05		5 60
				6	06		6 72
				7	07		7 84
				8	08		8 96
				9	09		9 108
							10 120

Explanation of the use of the three preceding Tables of interest, at 8, 10, and 12 per cent for any time to come, which are found by the following proportion 365×100 : are to the rate per cent $:: 1 \times 1$: are to the Decimals for one day, from which the other numbers are made by continual addition.

1st. If the sum given have annas and pie, they must be reduced to decimals of a rupee by table the ninth.

2dly. Multiply the sum given by the decimal parts opposite the time, for which the interest is required, the product, when the decimal places are cut off, produces the answer.

3dly. Seek in the table of decimal parts for the value of the decimal.

(1) Required the interest of 1000 rupees for 225 days at 8 per cent?

Opposite 225 are the figures0493150
which I multiply by the sum given 1000

and cut off the 7 places of decimals 49.3150000
The value of the decimal, according to Table IX. is 5 annas. The interest of 1000 rupees for 225 days at 8 per cent is therefore 49rs. 5a.

(2) Required the interest of 2750rs. 12a. for 1 year and 3 months at 10 per cent?

Opposite 1 year .1
Opposite 3 months .025

Their sum 125

Principal 2750.75
125

13 75375
330 0900

Interest.....343.84375=13.6

(3) Required the interest of 1250rs. 5a. 4p. for 2 yrs. 3 mo. 15 ds. or 2 yrs. 106ds. at 12 per cent.

Opposite 2 years are .24
 Opposite 106 days are .034849

Their sum.....274849
 Principal.....1250.33

824547

824547

13 742450

329 8188

Interest343.65195017=10a. 5p.

Table IV.
Of converging Series, or extracting the Roots of all Powers.
 A TABLE OF POWERS.

Roots,..... or 1st Powers.	2	3	4	5	6	7	8	9
Squares,..... or 2d Pws.	4	9	16	25	36	49	64	81
Cubes,..... or 3d Pws.	8	27	64	125	216	343	512	729
Biquadrates,.... or 4th Pws.	16	81	256	625	1296	2401	4096	6561
Quintals,..... or 5th Pws.	32	243	1024	3125	7776	16807	32768	59049
Square cubes,.... or 6th Pws.	54	729	4096	15625	46656	117649	262144	531441
Second sursolids, or 7th Pws.	128	2187	16384	78125	270636	823543	2097152	4782969
Biquadrates equl. or 8th Pws.	256	6561	65536	390625	1679616	5764801	16777216	43046721
Cubes cubed,.... or 9th Pws.	512	19683	262144	1953125	10077066	40353607	134217728	387430489
Sursolids squared, or 10th Pws.	1024	59049	1048576	9765625	60466176	282475249	1073741824	3486784401
Third sursolids,.. or 11th Pws.	2048	177147	4194304	48928125	362797056	1977320743	8599234592	31381059609
Square cubes squd. or 12th Pws.	4096	531441	16777216	244140625	2176782336	13841287201	66719476736	252429836481
Fourth sursolids, or 13th Pws.	8192	1594323	67108864	1220703125	13060694016	96889010407	549755813888	2541865898329
Sec. sursolids equl. or 14th Pws.	16384	4782969	263435456	6103515625	78364161066	678223072849	4396046811104	22876792454961
Sursolids cubed,.. or 15th Pws.	32768	14348907	1073741824	31517578125	470184984576	4747561509943	335184572088832	205991139091649

Table V.

A Table for reducing Rupees of 8, 11, and 16 per Cent better than Current to Current Rupees and vice versa; also for reducing Sicca Rupees into Arcot and Sonaut, and vice versa.

INDEX.	Sicca Rupees to Current at 16 per Cent.	Arcot Rupees to Current at 8 per Cent.	Sonaut Rupees to Current at 11 per Cent.	Current Rupees to Sicca Rupees at 16 per Cent.	Current Rupees to Arcot Rupees at 8 per Cent.
1	1160000	1080000	1110000	0862069	0925926
2	2320000	2160000	2220000	1724138	1851852
3	3480000	3240000	3330000	2586207	2777778
4	4640000	4320000	4440000	3448276	3703704
5	5800000	5400000	5550000	4310345	4629629
6	6960000	6480000	6660000	5172414	5555555
7	8120000	7560000	7770000	6034483	6481481
8	9280000	8640000	8880000	6896552	7407407
9	1044000	9720000	9990000	7758621	8333333
INDEX.	Current Rupees to Sonaut at 11 per Cent.	Sicca Rupees to Arcot, or 16 per Ct. to 8 per Ct.	Sicca Rupees to Sonaut, or 16 per Ct. to 11 per Ct.	Arcot Rupees to Sicca, or 8 per Ct. to 16 per Ct.	Sonaut Rupees to Sicca, or 11 per Ct. to 16 per Ct.
1	0900900	1074074	1045045	0931034	0956896
2	1801802	2148148	2090090	1862069	1913793
3	2702703	3222222	3135135	2793103	2870699
4	3603604	4296296	4180180	3724139	3827580
5	4504504	5370370	5225225	4655172	4784483
6	5405405	6444444	6270270	5586207	5741379
7	6306306	7518518	7315315	6517241	6698276
8	7207207	8592592	8360360	7448276	7655172
9	8108108	9666666	9405405	8379310	8612069

Explanation of the foregoing Table, which is found thus:

$100 + 16 = 116$	$111)100(0900900$
$100 + 8 = 108$	$100)116(1074074$
$100 + 11 = 111$	$111)116(1045045$
$116)100(0862069$	$116)108(0931034$
$108)100(0925926$	$116)111(0956896$

The other numbers are made by addition.

Suppose it was required to reduce 5746 sicca rupees to sonaut rupees,

Under the column of sicca specie reduced to sonaut,

And opposite 5 in the index, are 5225.225

Ditto..... 7 731.531

Ditto..... 4 41.801

Ditto..... 6 6.270

Ans. S. Rs. 6004.827=13a.2p.

Cut off as many places to the left for integers, as the number sought for contains, and place the integers and decimals regularly under each other, as above.

(1) Reduce 735 s. rs. 11 a. 6 p. to Arcot rupees.

7 - 751.8518

3 - 32.2222

5 - 5.3703

.7 - .7518

.1 - .107

.8 - .85

Ans. A. Rs. 790.2153=3a. 5.

(2) Reduce 849 ct. rs. 12 a. 4 p. to sicca rupces.

8 - 689.6552

4 - 34.4827

9 - 7.7586

.7 - .6034

.5 - .431

Ans. S. Rs. 732.5430=8a. 8p.

(3) Reduce 2500 snt. rs. 8 a. to sicca rupees.

2 - 1913.798

5 - 478.448

5 - .478

Ans. S. Rs. 2392.719=11 6

(4) Reduce 70.000 current rupees to Arcot.

Ans. A. Rs. 648148=13

Table VI.

A Table for reducing Sicca Rupees (from 1s. 11d. the Current Rupee to 2s. 3d.) to Pound Sterling, and vice versa.

INDEX.	S. Rs. at 2s. 3d. per Ct. R. reduced to Pounds Sterling.	S. Rs. at 2s. 2d. per Ct. R. reduced to Pounds Sterling.	S. Rs. at 2s. 1d. per Ct. R. reduced to Pounds Sterling.	S. Rs. at 2s. per Ct. R. reduced to Pounds Sterling.	S. Rs. at 1s. 11d. per Ct. R. reduced to Pounds Sterling.
1	0130500	0125666	0120833	0116000	0111166
2	0261000	0251333	0241666	0232000	0222333
3	0391500	0377000	0362500	0348000	0333500
4	0522000	0502666	0483333	0464000	0444666
5	0652500	0628333	0604166	0580000	0555833
6	0783000	0754000	0725000	0696000	0667000
7	0913500	0879666	0845833	0812000	0778166
8	1044000	1005333	0966666	0928000	0889333
9	1174500	1131000	1087500	1044000	1000500
INDEX.	Pounds Sterling reduced to S. Rs. at 2s. 3d. per Ct. R.	Pounds Sterling reduced to S. Rs. at 2s. 2d. per Ct. R.	Pounds Sterling reduced to S. Rs. at 2s. 1d. per Ct. R.	Pounds Sterling reduced to S. Rs. at 2s. per Ct. R.	Pounds Sterling reduced to S. Rs. at 1s. 11d. per Ct. R.
1	766283	795756	827586	862069	892550
2	1532567	1591512	1655172	1724138	1599100
3	2298850	2387268	2482758	2586207	2698650
4	3065134	3183024	3310345	3448276	3698200
5	3831417	3978780	4137931	4310345	4497750
6	4597701	4774536	4965517	5172414	5397300
7	5363984	5570292	5793103	6034483	6296850
8	6130268	6366048	6620689	6896552	7196400
9	6896552	7161804	7448276	7758621	8095950

Explanation of the foregoing Table, the first line of figures of which in each column of Rupees reduced to Currency are found thus.

s. rs. c. rs.	d.	s. rs.	d.	or	£. stg.
100: 116 each	$\left\{ \begin{array}{c} 23 \\ 24 \\ 25 \\ 26 \\ 27 \end{array} \right\}$	$\therefore 1:$	$\left\{ \begin{array}{c} 26.68 \\ 27.84 \\ 29.00 \\ 30.16 \\ 31.32 \end{array} \right\}$		$\left\{ \begin{array}{c} .111166 \\ .116000 \\ .120833 \\ .125666 \\ .1305 \end{array} \right\}$

And the first line of figures in each column of pounds sterling reduced to current rupees are found thus.

ct. rs.	d.	s. rs. l. stg.	£. stg.
116 ea.	$\left\{ \begin{array}{c} 23 \\ 24 \\ 25 \\ 26 \\ 27 \end{array} \right\}$	$\therefore 100 \frac{1}{4} : 1$	$\left\{ \begin{array}{c} .899550 \\ .862069 \\ .827586 \\ .795756 \\ .766283 \end{array} \right\}$

The other numbers are found by the continual addition of the first number.

To work questions by the Tables.

The Index shews the given sum, opposite which is its value in the denomination you wish to reduce them to, cutting off as many places of decimals on the left hand, as the given sum consists of integers.

Thus, if 5748 s. rs. exchange at 1s. 11d. per current rupee are given to be reduced to pounds sterling,

I find opposite to 5	-	0555.833
7	-	077 816
4	-	04.446
8	-	0.889

Ansr. £. stg. 638 984 = 19s 8 64d.

Or if £.765 sterling are required to be reduced to sicca rupees, when the current rupee in exchange is reckoned at 25d.

Opposite 7	-	5793.103
6	-	496.551
5	-	41.379

S. Rs. 6331.033

(3) Again reduce 5948s. rs. 7a. 8p. exchange at 2s. per current rupee to pounds sterling.

5	-	0580
9	-	104 4
4	-	04.64
8	-	0.928
.4	-	.046
.7	-	.08
.9	-	.1

£ sterl. 690.023

(4) In £500 12s. 6d. how many sicca rupees, when the current rupee in exchange is reckoned at 2s. 2d. each?

5	-	3978.78
6	-	4 774
2	-	.159
5	-	.39

Ansr. S. Rs. 3983.752

(5) In £10,000 how many sicca rupees, valuing the current rupee at 2s. 3d.?

Table VII.

A Table for reducing Current Rupees from 1s. 11d. to 2s. 3d. each to Pounds Sterling, and vice versa.

INDEX.	C. Rs. at 2s. 3d. reduced to Pounds Sterling.	C. Rs. at 2s. 2d. reduced to Pounds Sterling.	C. Rs. at 2s. 1d. reduced to Pounds Sterling.	C. Rs. at 2s. reduced to Pounds Sterling.	C. Rs. at 1s. 11d. reduced to Pounds Sterling.
1	0112500	0108333	0104166	0100000	0095833
2	0225000	0216666	0208333	0200000	0191666
3	0337500	0325000	0312500	0300000	0287500
4	0450000	0433333	0416666	0400000	0383333
5	0562500	0541666	0520833	0500000	0479166
6	0675000	0650000	0625000	0600000	0575000
7	0787500	0758333	0729166	0700000	0670833
8	0900000	0866666	0833333	0800000	0766666
9	1012500	0975000	0937500	0900000	0862500
INDEX.	Pounds Sterling reduced to C. Rs. at 2s. 3d.	Pounds Sterling reduced to C. Rs. at 2s. 2d.	Pounds Sterling reduced to C. Rs. at 2s. 1d.	Pounds Sterling reduced to C. Rs. at 2s.	Pounds Sterling reduced to C. Rs. at 1s. 11d.
1	888888	923077	960000	1000000	1043478
2	1777777	1846154	1920000	2000000	2086956
3	2666666	2769230	2880000	3000000	3130435
4	3555555	3692308	3840000	4000000	4173913
5	4444444	4615385	4800000	5000000	5217391
6	5333333	5538461	5760000	6000000	6260869
7	6222222	6461538	6720000	7000000	7304348
8	7111111	7384615	7680000	8000000	8347826
9	8000000	8307692	8640000	9000000	9391304

Explanation of the foregoing table,—the first line of figures of which in each column of rupces reduced to currency are found by taking the decimal parts of the value of one rupee,

$$\begin{array}{l} \text{Thus, 23 d.} \\ 24 \\ 25 \\ 26 \\ 27 \end{array} \left. \vphantom{\begin{array}{l} 23 \\ 24 \\ 25 \\ 26 \\ 27 \end{array}} \right\} \div \text{by 12 and 20} = \left\{ \begin{array}{l} .095833 \\ .010000 \\ .010416 \\ .010833 \\ .011250 \end{array} \right.$$

And the first line of figures in each column of pounds reduced to current rupees, are found by the following proportions:

$$\begin{array}{l} 23 \text{ d.} \\ 24 \\ 25 \\ 26 \\ 27 \end{array} \left. \vphantom{\begin{array}{l} 23 \\ 24 \\ 25 \\ 26 \\ 27 \end{array}} \right\} \text{C. R. 1} :: \text{L. Ster. 1} \left\{ \begin{array}{l} 1043478 \\ 1 \\ 96 \\ 923077 \\ 888888 \end{array} \right.$$

The other numbers are found by Addition.

To work Questions in the Tables.

Use the same rule as given in the Explanation of Table V.

(1) Reduce 5000 current rupees, each 2s. 11d. to £. sterl.

(2) How many current rupees each 2s. are in £. 4518?

$$\begin{array}{r} 4 - 40000 \\ 5 - 5000 \\ 1 - 100 \\ 8 - 80 \\ \hline \text{Ansr. C. Rs. } 45180 \end{array}$$

(3) How many pounds are in 6425 c. rs. 12a. each 2s. 1d.?

6	-	0625.000
4	-	041.666
2	-	02.083
5	-	0.520
.7	-	.072
.5	-	.05

Ans. L. sterl. 669.346 = 6s. 11d.

(4) How many current rupees each 2s. 2d. are in
£. 27560 7s. 6d.?

2	-	184615.4
7	-	64615.39
5	-	4615.385
6	-	553.846
.3	-	2.769
.7	-	.646
.5	-	.46

Ans. C. Rs 254403.482 = 7a. 8p.

(5) How many £. sterl are in 50600 current rupees each 2s. 3d.?

5	-	05625.00
6	-	067.50

£. sterl. 5692.50 = 10s. Ans.

Table VIII.

A Table for reducing Weights of one Denomination, into Weights of another Denomination, retaining the same value.

INDEX.	To reduce Bazar Maunds into Factory Maunds.	To reduce Factory Maunds into Bazar Maunds.	To reduce Bazar Maunds into Avoirdupois weight.	To reduce Factory Maunds to Avoirdupois weight.	To reduce Avoirdupois weight to Bazar Maunds.
1	1100000	0909090	0733333	666666	136363
2	2200000	1818182	1466666	1333333	272727
3	3300000	2727272	2200000	2000000	409091
4	4400000	3636363	2933333	2666666	545454
5	5500000	4545454	3666666	3333333	681818
6	6600000	5454545	4400000	4000000	818182
7	7700000	6363636	5133333	4666666	954545
8	8800000	7272727	5866666	5333333	1090909
9	9900000	8181818	6600000	6000000	1127273

INDEX.	To reduce Avoirdupois weight to Factory Maunds.	To reduce Bazar Maunds to Madras Maunds.	To reduce Factory Maunds to Madras Maunds.	To reduce Madras Maunds to Bazar Maunds.	To reduce Madras Maunds to Factory Maunds.
1	150000	398533	298666	0304384	0334824
2	300000	657066	597333	0608769	0669649
3	450000	985600	896000	0913153	1004473
4	600000	1314133	1194666	1217537	1339298
5	750000	1642666	1493333	1521922	1674122
6	900000	1971200	1792000	1826306	2008946
7	1050000	2299733	2090666	2130690	2343771
8	1200000	2628266	2389333	2435075	2678595
9	1350000	2956800	2688000	2739459	3013420

Explanation of Table VIII.

\ The first lines in each column of which are wrought for agreeable to the rules and proportions laid down in comparison of weights and measures, and are quotients to the fractions on the top of each column, the upper number being the dividend and the lower the divisor. To solve questions by the table, observe the same rules as given to tables 5th, 6th, and 7th.

(1) In 700 bazar maunds how many factory maunds?

Opposite 7 are 770.000, from which cut off three figures to the left for hundreds, and you have the answer in factory maunds.

(2) In 500 factory maunds how many bazar maunds? Ansr. f. mds. $454.5454 = 21$ srs. 13 chs.

(3) In 895 bazar maunds how many cwt.?

$$\begin{array}{rcl} 8 & - & 586.6666 \\ 9 & - & 66.0000 \\ 5 & - & 3.6666 \end{array}$$

Ansr. Cwt. $656.3332 = 1$ qr. 9 lb. 6 oz.

(4) In 700 f. mds. 20 srs. how many cwt.?

$$\begin{array}{rcl} 7 & - & 466.6666 \\ 5 & - & .3333 \end{array}$$

Ansr. Cwts. $466.9999 = 467$ cwt.

(5) In 19t. 14cwt. 2qrs. 5lb. avoirdupois weight how many bazar maunds?

$$\begin{array}{rcl} 19 & 3 & - & 409.091 \\ 20 & 9 & - & 122.727 \\ \hline & 4 & - & 5.454 \\ 394 & .5 & - & 681 \\ \hline & .4 & - & 54 \\ & .4 & - & 5 \end{array}$$

Ansr. B. Mds. $538.012 = 1$ ch.

(6) In 840 bazar maunds how many Madras maunds?

$$\begin{array}{rcl} 8 & - & 2628.266 \\ 4 & - & 131.413 \\ \hline \end{array}$$

Ansr. Mad. Mds. 2759.679 = 5vis. 17pol.

(7) In factory mds. 65 10srs. how many Madras mds.?

$$\begin{array}{rcl} 6 & - & 179.2000 \\ 5 & - & 14.9333 \\ 2 & - & 5975 \\ 5 & - & 1493 \\ \hline \end{array}$$

Ansr. Madras mds. 194.8801 = 7vis. 1pol.

(8) In 5 cands. 14mds. 4vis. of Madras, how many bazar maunds?

$$\begin{array}{rcl} 20 & 1 & - 030.4383 \\ \hline & 1 & - 03.0438 \\ 114 \text{ mds.} & 4 & - 1.2175 \\ & 5 & - 1521 \\ \hline \end{array}$$

Ansr. B. mds. 34.8517 = 34srs. 1ch.

Table IX.

DECIMAL PARTS OF A RUPEE.

As. Pie.	Decimal Parts.	As. Pie.	Decimal Parts.	As. Pie.	Decimal Parts.	As. Pie.	Decimal Parts.
1	0052083	1	2552083	1	5052083	1	7552083
2	0104166	2	2604166	2	5104166	2	7604166
3	015625	3	265625	3	515625	3	765625
4	0208333	4	2708333	4	5208333	4	7708333
5	0260416	5	2760416	5	5260416	5	7760416
6	03125	6	28125	6	53125	6	78125
7	0364583	7	2864583	7	5364583	7	7864583
8	0416666	8	2916666	8	5416666	8	7916666
9	046875	9	296875	9	546875	9	796875
10	0520833	10	3020833	10	5520833	10	8020833
11	0572916	11	3072916	11	5572916	11	8072916
1 As.	0625	5 As.	3125	9 As.	5625	13 As.	8125
1	0677083	1	3177083	1	5677083	1	8177083
2	0729166	2	3229166	2	5729166	2	8229166
3	078125	3	328125	3	578125	3	828125
4	0833333	4	3333333	4	5833333	4	8333333
5	0885416	5	3385416	5	5885416	5	8385416
6	09375	6	34375	6	59375	6	84375
7	0989583	7	3489583	7	5989583	7	8489583
8	1041666	8	3541666	8	6041666	8	8541666
9	109375	9	359375	9	609375	9	859375
10	1145833	10	3645833	10	6145833	10	8645833
11	1197916	11	3697916	11	6197916	11	8697916
2 As.	125	6 As.	375	10 As.	625	14 As.	875
1	1302083	1	3802083	1	6302083	1	8802083
2	1354166	2	3854166	2	6354166	2	8854166
3	140625	3	390625	3	640625	3	890625
4	1458333	4	3958333	4	6458333	4	8958333
5	1510416	5	4010416	5	6510416	5	9010416
6	15625	6	40625	6	65625	6	90625
7	1614583	7	4114583	7	6614583	7	9114583
8	1666666	8	4166666	8	6666666	8	9166666
9	171875	9	421875	9	671875	9	921875
10	1770833	10	4270833	10	6770833	10	9270833
11	1822916	11	4322916	11	6822916	11	9322916
3 As.	1875	7 As.	4375	11 As.	6875	15 As.	9375
1	1927083	1	4427083	1	6927083	1	9427083
2	1979166	2	4479166	2	6979166	2	9479166
3	203125	3	453125	3	703125	3	953125
4	2083333	4	4583333	4	7083333	4	9583333
5	2135416	5	4635416	5	7135416	5	9635416
6	21875	6	46875	6	71875	6	96875
7	2239583	7	4739583	7	7239583	7	9739583
8	2291666	8	4791666	8	7291666	8	9791666
9	234375	9	484375	9	734375	9	984375
10	2395833	10	4895833	10	7395833	10	9895833
11	2447916	11	4947916	11	7447916	11	9947916
4 As.	25	8 As.	45	12 As.	75	1 Rupee	0000000

Table X.

DECIMAL PARTS OF A POUND STERLING.

Pence	1	0041666	5	Shill.	2500000	10	Shill.	5000000	15	Shill.	7500000
	2	0083333		1.	2541666		1	5041666		1	7541666
	3	0125000		2	2583333		2	5083333		2	7583333
	4	0166666		3	2625000		3	5125000		3	7625000
	5	0203333		4	2666666		4	5166666		4	7666666
	6	0250000		5	2708333		5	5208333		5	7708333
	7	0291666		6	2750000		6	5250000		6	7750000
	8	0333333		7	2791666		7	5291666		7	7791666
	9	0375000		8	2833333		8	5333333		8	7833333
	10	0416666		9	2875000		9	5375000		9	7875000
	11	0458333		10	2916666		10	5416666		10	7916666
				11	2958333		11	5458333		11	7958333
1	Shill.	0500000	6	Shill.	3000000	11	Shill.	5500000	16	Shill.	8000000
	1	0541666		1	3041666		1	5541666		1	8041666
	2	0583333		2	3083333		2	5583333		2	8083333
	3	0625000		3	3125000		3	5625000		3	8125000
	4	0666666		4	3166666		4	5666666		4	8166666
	5	0708333		5	3208333		5	5708333		5	8208333
	6	0750000		6	3250000		6	5750000		6	8250000
	7	0791666		7	3291666		7	5791666		7	8291666
	8	0833333		8	3333333		8	5833333		8	8333333
	9	0875000		9	3375000		9	5875000		9	8375000
	10	0916666		10	3416666		10	5916666		10	8416666
	11	0958333		11	3458333		11	5958333		11	8458333
2	Shill.	1000000	7	Shill.	3500000	12	Shill.	6000000	17	Shill.	8500000
	1	1041666		1	3541666		1	6041666		1	8541666
	2	1083333		2	3583333		2	6083333		2	8583333
	3	1125000		3	3625000		3	6125000		3	8625000
	4	1166666		4	3666666		4	6166666		4	8666666
	5	1208333		5	3708333		5	6208333		5	8708333
	6	1250000		6	3750000		6	6250000		6	8750000
	7	1291666		7	3791666		7	6291666		7	8791666
	8	1333333		8	3833333		8	6333333		8	8833333
	9	1375000		9	3875000		9	6375000		9	8875000
	10	1416666		10	3916666		10	6416666		10	8916666
	11	1458333		11	3958333		11	6458333		11	8958333
3	Shill.	1500000	8	Shill.	4000000	13	Shill.	6500000	18	Shill.	9000000
	1	1541666		1	4041666		1	6541666		1	9041666
	2	1583333		2	4083333		2	6583333		2	9083333
	3	1625000		3	4125000		3	6625000		3	9125000
	4	1666666		4	4166666		4	6666666		4	9166666
	5	1708333		5	4208333		5	6708333		5	9208333
	6	1750000		6	4250000		6	6750000		6	9250000
	7	1791666		7	4291666		7	6791666		7	9291666
	8	1833333		8	4333333		8	6833333		8	9333333
	9	1875000		9	4375000		9	6875000		9	9375000
	10	1916666		10	4416666		10	6916666		10	9416666
	11	1958333		11	4458333		11	6958333		11	9458333
4	Shill.	2000000	9	Shill.	4500000	14	Shill.	7000000	19	Shill.	9500000
	1	2041666		1	4541666		1	7041666		1	9541666
	2	2083333		2	4583333		2	7083333		2	9583333
	3	2125000		3	4625000		3	7125000		3	9625000
	4	2166666		4	4666666		4	7166666		4	9666666
	5	2208333		5	4708333		5	7208333		5	9708333
	6	2250000		6	4750000		6	7250000		6	9750000
	7	2291666		7	4791666		7	7291666		7	9791666
	8	2333333		8	4833333		8	7333333		8	9833333
	9	2375000		9	4875000		9	7375000		9	9875000
	10	2416666		10	4916666		10	7416666		10	9916666
	11	2458333		11	4958333		11	7458333		11	9958333

Table XI.

DECIMAL PARTS OF A MAUND.

Ch.	1	0015625	3	Srs.	0750000	6	Srs.	1500000	9	Srs.	2250000
	2	0031250		1	0765625		1	1515625		1	2265625
	3	0046875		2	0781250		2	1531250		2	2281250
	4	0062500		3	0796875		3	1546875		3	2296875
	5	0078125		4	0812500		4	1562500		4	2312500
	6	0003750		5	0828125		5	1578125		5	2328125
	7	0109375		6	0843750		6	1593750		6	2343750
	8	0125000		7	0859375		7	1609375		7	2359375
	9	0140625		8	0875000		8	1625000		8	2375000
	10	0156250		9	0890625		9	1640625		9	2390625
	11	0171875		10	0906250		10	1656250		10	2406250
	12	0187500		11	0921875		11	1671875		11	2421875
	13	0203125		12	0937500		12	1687500		12	2437500
	14	0218750		13	0953125		13	1703125		13	2453125
	15	0234375		14	0968750		14	1718750		14	2468750
				15	0984375		15	1734375		15	2484375
1	Sr.	0250000	4	Srs.	1000000	7	Srs.	1750000	10	Srs.	2500000
	1	0265625		1	1015625		1	1765625		1	2515625
	2	0281250		2	1031250		2	1781250		2	2531250
	3	0296875		3	1046875		3	1796875		3	2546875
	4	0312500		4	1062500		4	1812500		4	2562500
	5	0328125		5	1078125		5	1828125		5	2578125
	6	0343750		6	1093750		6	1843750		6	2593750
	7	0359375		7	1109375		7	1859375		7	2609375
	8	0375000		8	1125000		8	1875000		8	2625000
	9	0390625		9	1140625		9	1890625		9	2640625
	10	0406250		10	1156250		10	1906250		10	2656250
	11	0421875		11	1171875		11	1921875		11	2671875
	12	0437500		12	1187500		12	1937500		12	2687500
	13	0453125		13	1203125		13	1953125		13	2703125
	14	0468750		14	1218750		14	1968750		14	2718750
	15	0484375		15	1234375		15	1984375		15	2734375
2	Srs.	0500000	5	Srs.	1250000	8	Srs.	2000000	11	Srs.	2730000
	1	0515625		1	1265625		1	2015625		1	2765625
	2	0531250		2	1281250		2	2031250		2	2781250
	3	0546875		3	1296875		3	2046875		3	2796875
	4	0562500		4	1312500		4	2062500		4	2812500
	5	0578125		5	1328125		5	2078125		5	2828125
	6	0593750		6	1343750		6	2093750		6	2843750
	7	0609375		7	1359375		7	2109375		7	2859375
	8	0625000		8	1375000		8	2125000		8	2875000
	9	0640625		9	1390625		9	2140625		9	2890625
	10	0656250		10	1406250		10	2156250		10	2906250
	11	0671875		11	1421875		11	2171875		11	2921875
	12	0687500		12	1437500		12	2187500		12	2937500
	13	0703125		13	1453125		13	2203125		13	2953125
	14	0718750		14	1468750		14	2218750		14	2968750
	15	0734375		15	1484375		15	2234375		15	2984375

Table XI.

DECIMAL PARTS OF A MAUND.

12 Srs.	3000000	14 Srs.	3750000	18 Srs.	4500000	21 Srs.	5250000
1	3015625	1	3765625	1	4515625	1	5265625
2	3021250	2	3781250	2	4531250	2	5281250
3	3046875	3	3796875	3	4546875	3	5296875
4	3062500	4	3812500	4	4562500	4	5312500
5	3078125	5	3828125	5	4578125	5	5328125
6	3093750	6	3843750	6	4593750	6	5343750
7	3109375	7	3859375	7	4609375	7	5359375
8	3125000	8	3875000	8	4625000	8	5375000
9	3140625	9	3890625	9	4640625	9	5390625
10	3156250	10	3906250	10	4656250	10	5406250
11	3171875	11	3921875	11	4671875	11	5421875
12	3187500	12	3937500	12	4687500	12	5437500
13	3203125	13	3953125	13	4703125	13	5453125
14	3218750	14	3968750	14	4718750	14	5468750
15	3234375	15	3984375	15	4734375	15	5484375
13 Srs.	3250000	16 Srs.	4000000	19 Srs.	4750000	22 Srs.	5500000
1	3265625	1	4015625	1	4765625	1	5515625
2	3281250	2	4031250	2	4781250	2	5531250
3	3296875	3	4046875	3	4796875	3	5546875
4	3312500	4	4062500	4	4812500	4	5562500
5	3328125	5	4078125	5	4828125	5	5578125
6	3343750	6	4093750	6	4843750	6	5593750
7	3359375	7	4109375	7	4859375	7	5609375
8	3375000	8	4125000	8	4875000	8	5625000
9	3390625	9	4140625	9	4890625	9	5640625
10	3406250	10	4156250	10	4906250	10	5656250
11	3421875	11	4171875	11	4921875	11	5671875
12	3437500	12	4187500	12	4937500	12	5687500
13	3453125	13	4203125	13	4953125	13	5703125
14	3468750	14	4218750	14	4968750	14	5718750
15	3484375	15	4234375	15	4984375	15	5734375
14 Srs.	3500000	17 Srs.	4250000	20 Srs.	5000000	23 Srs.	5750000
1	3515625	1	4265625	1	5015625	1	5765625
2	3531250	2	4281250	2	5031250	2	5781250
3	3546875	3	4296875	3	5046875	3	5796875
4	3562500	4	4312500	4	5062500	4	5812500
5	3578125	5	4328125	5	5078125	5	5828125
6	3593750	6	4343750	6	5093750	6	5843750
7	3609375	7	4359375	7	5109375	7	5859375
8	3625000	8	4375000	8	5125000	8	5875000
9	3640625	9	4390625	9	5140625	9	5890625
10	3656250	10	4406250	10	5156250	10	5906250
11	3671875	11	4421875	11	5171875	11	5921875
12	3687500	12	4437500	12	5187500	12	5937500
13	3703125	13	4453125	13	5203125	13	5953125
14	3718750	14	4468750	14	5218750	14	5968750
15	3734375	15	4484375	15	5234375	15	5984375

Table XI.

DECIMAL PARTS OF A MAUND.

24 Srs.	6000000	27 Srs.	6750000	30 Srs.	7500000	33 Srs.	8250000
1	6015625	1	6765625	1	7515625	1	8265625
2	6031250	2	6781250	2	7531258	2	8281250
3	6046875	3	6796875	3	7546875	3	8296875
4	6062500	4	6812500	4	7562500	4	8312500
5	6078125	5	6828125	5	7578125	5	8328125
6	6093750	6	6843750	6	7593750	6	8343750
7	6109375	7	6859375	7	7609375	7	8359375
8	6125000	8	6875000	8	7625000	8	8375000
9	6140625	9	6890625	9	7640625	9	8390625
10	6156250	10	6906250	10	7656250	10	8406250
11	6171875	11	6921875	11	7671875	11	8421875
12	6187500	12	6937500	12	7687500	12	8437500
13	6203125	13	6953125	13	7703125	13	8453125
14	6218750	14	6968750	14	7718750	14	8468750
15	6234375	15	6984375	15	7734375	15	8484375
25 Srs.	6250000	28 Srs.	7000000	31 Srs.	7750000	34 Srs.	8500000
1	6265625	1	7015625	1	7765625	1	8515625
2	6281250	2	7031250	2	7781250	2	8531250
3	6296875	3	7046875	3	7796875	3	8546875
4	6312500	4	7062500	4	7812500	4	8562500
5	6328125	5	7078125	5	7828125	5	8578125
6	6343750	6	7093750	6	7843750	6	8593750
7	6359375	7	7109375	7	7859375	7	8609375
8	6375000	8	7125000	8	7875000	8	8625000
9	6390625	9	7140625	9	7890625	9	8640625
10	6406250	10	7156250	10	7906250	10	8656250
11	6421875	11	7171875	11	7921875	11	8671875
12	6437500	12	7187500	12	7937500	12	8687500
13	6453125	13	7203125	13	7953125	13	8703125
14	6468750	14	7218750	14	7968750	14	8718750
15	6484375	15	7234375	15	7984375	15	8734375
26 Srs.	6500000	29 Srs.	7250000	32 Srs.	8000000	35 Srs.	8750000
1	6515625	1	7265625	1	8015625	1	8765625
2	6531250	2	7281250	2	8031250	2	8781250
3	6546875	3	7296875	3	8046875	3	8796875
4	6562500	4	7312500	4	8062500	4	8812500
5	6578125	5	7328125	5	8078125	5	8828125
6	6593750	6	7343750	6	8093750	6	8843750
7	6609375	7	7359375	7	8109375	7	8859375
8	6625000	8	7375000	8	8125000	8	8875000
9	6640625	9	7390625	9	8140625	9	8890625
10	6656250	10	7406250	10	8156250	10	8906250
11	6671875	11	7421875	11	8171875	11	8921875
12	6687500	12	7437500	12	8187500	12	8937500
13	6703125	13	7453125	13	8203125	13	8953125
14	6718750	14	7468750	14	8218750	14	8968750
15	6734375	15	7484375	15	8234375	15	8984375

Cable XI.

DECIMAL PARTS OF A MAUND.

36 Srs.	9000000	37 Srs.	9250000	38 Srs.	9500000	39 Srs.	9750000
1	9015625	1	9265625	1	9515625	1	9765625
2	9031250	2	9281250	2	9531250	2	9781250
3	9046875	3	9296875	3	9546875	3	9796875
4	9062500	4	9312500	4	9562500	4	9812500
5	9078125	5	9328125	5	9578125	5	9828125
6	9093750	6	9343750	6	9593750	6	9843750
7	9109375	7	9359375	7	9609375	7	9859375
8	9125000	8	9375000	8	9625000	8	9875000
9	9140625	9	9390625	9	9640625	9	9890625
10	9156250	10	9406250	10	9656250	10	9906250
11	9171875	11	9421875	11	9671875	11	9921875
12	9187500	12	9437500	12	9687500	12	9937500
13	9203125	13	9453125	13	9703125	13	9953125
14	9218750	14	9468750	14	9718750	14	9968750
15	9234375	15	9484375	15	9734375	15	9984375

Table XII.

DECIMAL PARTS OF AN HUNDRED WEIGHT.

qr. lb. oz.		qr. lb. oz.		qr. lb. oz.	
		11	0982143	22	1964286
4	0022321	4	1004464	4	1986607
8	0044643	8	1026786	8	2008928
12	0066964	12	1049107	12	2031250
1	0089286	12	1071428	23	2053571
4	0111607	4	1093750	4	2075893
8	0133928	8	1116071	8	2098214
12	0156250	12	1138393	12	2120536
2	0178571	13	1160714	24	2142857
4	0200893	4	1183036	4	2165178
8	0223214	8	1205357	8	2187500
12	0245536	12	1227678	12	2209821
3	0267857	14	1250000	25	2232143
4	0290178	4	1272321	4	2254464
8	0312500	8	1294643	8	2276786
12	0334821	12	1316963	12	2299107
4	0357143	13	1339286	26	2321428
4	0379464	4	1361607	4	2343750
8	0401786	8	1383928	8	2366071
12	0424107	12	1406250	12	2388393
6	0446428	16	1428571	27	2410761
4	0468750	4	1450893	4	2433036
8	0491071	8	1473214	8	2455357
12	0513393	12	1495536	12	2477678
6	0535714	17	1517857	1	2500000
4	0558036	4	1540178	4	2522321
8	0580357	8	1562500	8	2544643
12	0602678	12	1584821	12	2566964
7	0625000	18	1607143	1 1	2589286
4	0647321	4	1629464	4	2611607
8	0669643	8	1651786	8	2633928
12	0691964	12	1674107	12	2656250
8	0714286	19	1696428	1 2	2678571
4	0736607	4	1718750	4	2700893
8	0758928	8	1741071	8	2723214
12	0781250	12	1763393	12	2745536
9	0803571	20	1785714	1 3	2767857
4	0825893	4	1808036	4	2790178
8	0848214	8	1830357	8	2812500
12	0870536	12	1852678	12	2834821
10	0892857	21	1875000	1 4	2857143
4	0915178	4	1897321	4	2879464
8	0937500	8	1919643	8	2901786
12	0959821	12	1941964	12	2924107

Table XII.

DECIMAL PARTS OF AN HUNDRED WEIGHT.

qr. lb. oz.		qr. lb. oz.		qr. lb. oz.	
1 5	2946428	1 16	3928571	1 27	4910764
4	2968750	4	3950893	4	4933036
8	2991071	8	3973214	8	4955357
12	3013393	12	3995536	12	4977678
1 6	3035714	1 17	4017857	2	5000000
4	3058036	4	4040178	4	5022321
8	3080357	8	4062500	8	5044643
12	3102678	12	4084821	12	5066964
1 7	3125000	1 18	4107143	2 1	5089286
4	3147321	4	4129464	4	5111607
8	3169643	8	4151786	8	5133928
12	3191964	12	4174107	12	5156250
1 8	3214286	1 19	4196428	2 2	5178571
4	3236607	4	4218750	4	5200893
8	3258928	8	4241071	8	5223214
12	3281250	12	4263393	12	5245536
1 9	3303571	1 20	4285714	2 3	5267857
4	3325893	4	4308036	4	5290178
8	3348214	8	4330357	8	5312500
12	3370536	12	4352678	12	5334821
1 10	3392857	1 21	4375000	2 4	5357143
4	3415178	4	4397321	4	5379464
8	3437500	8	4419643	8	5401786
12	3459821	12	4441964	12	5424107
1 11	3482143	1 22	4464286	2 5	5446428
4	3504464	4	4486607	4	5468750
8	3526786	8	4508928	8	5491071
12	3549107	12	4531250	12	5513393
1 12	3571428	1 23	4553571	2 6	5535714
4	3593750	4	4575893	4	5558036
8	3616071	8	4598214	8	5580357
12	3638392	12	4620536	12	5602678
1 13	3660714	1 24	4642857	2 7	5625000
4	3683036	4	4665178	4	5647321
8	3705357	8	4687500	8	5669643
12	3727678	12	4709821	12	5691964
1 14	3750000	1 25	4732143	2 8	5714286
4	3772321	4	4754464	4	5736607
8	3794643	8	4776786	8	5758928
12	3816964	12	4799107	12	5781250
1 15	3839286	1 26	4821428	2 9	5803571
4	3861607	4	4843750	4	5825893
8	3883928	8	4866071	8	5848214
12	3906250	12	4888393	12	5870536

Table XII.

DECIMAL PARTS OF AN HUNDRED WEIGHT.

qr. lb. oz.		qr. lb. oz.		qr. lb. oz.	
2 10	5892857	2 21	6875000	3 4	7857143
4	5915178	4	6897321	4	7879464
8	5937500	8	6919643	8	7901786
12	5959821	12	6941964	12	7924107
2 11	5982143	2 22	6964286	3 5	7946429
4	6004464	4	6986607	4	7968759
8	6026786	8	7008928	8	7991071
12	6049107	12	7031250	12	8013393
2 12	6071428	2 23	7053571	3 6	8035714
4	6093750	4	7075893	4	8058036
8	6116071	8	7098214	8	8080357
12	6138393	12	7120536	12	8102678
2 13	6160714	2 24	7142857	3 7	8125000
4	6183036	4	7165178	4	8147321
8	6205357	8	7187500	8	8169643
12	6227678	12	7209821	12	8191964
2 14	6250000	2 25	7232143	3 8	8214286
4	6272321	4	7254464	4	8236607
8	6294643	8	7276786	8	8258928
12	6316964	12	7299107	12	8281250
2 15	6339286	2 26	7321428	3 9	8303571
4	6361607	4	7343750	4	8325893
8	6383928	8	7366071	8	8348214
12	6406250	12	7388393	12	8370536
2 16	6428571	2 27	7410714	3 10	8392857
4	6450893	4	7433035	4	8415178
8	6473214	8	7455357	8	8437500
12	6495536	12	7477678	12	8459821
2 17	6517857	3	7500000	3 11	8482143
4	6540178	4	7522321	4	8504464
8	6562500	8	7544643	8	8526786
12	6584821	12	7566964	12	8549107
2 18	6607143	3 1	7589286	3 12	8571428
4	6629464	4	7611607	4	8593759
8	6651786	8	7633928	8	8616071
12	6674107	12	7656259	12	8638393
2 19	6696428	3 2	7678571	3 13	8660714
4	6718750	4	7700893	4	8683036
8	6741071	8	7723214	8	8705357
12	6763393	12	7745536	12	8727678
2 20	6785714	3 3	7767857	3 14	8750000
4	6808036	4	7790178	4	8772321
8	6830357	8	7812599	8	8794643
12	6852678	12	7834821	14	8816964

Table. XII.

DECIMAL PARTS OF AN HUNDRED WEIGHT.

qr. lb. oz.		qr. lb. oz.		qr. lb. oz.	
3 16	8839286	3 19 8	9241071	3 24	9642857
4	8861607	12	9263393	4	9665178
8	8883928	3 20	9285714	8	9687500
12	8906250	4	9308036	12	9709821
3 16	8928571	8	9330357	3 25	9732143
4	8950893	12	9352678	4	9754464
8	8973214	3 21	9375000	8	9776786
12	8995536	4	9397321	12	9799107
3 17	9017857	8	9419643	3 26	9821428
4	9040178	12	9441964	4	9843750
8	9062500	3 22	9464286	8	9866071
12	9084821	4	9486607	12	9888393
3 18	9107143	8	9508928	3 27	9910714
4	9129464	12	9531250	4	9933036
8	9151786	3 23	9553571	8	9955357
12	9174107	4	9575893	12	9977678
3 19	9196428	8	9598214	1 cwt.	1.00000
4	9218750	12	9620536		1

Explanation of Tables IX, X, XI, and XII.

The use of the foregoing Decimal Tables is to ascertain the value of their various parts, and where calculations are made with decimals, in preference to whole numbers, to shew the decimals equal to any part of the integer for which the Table is given, and which is clearly exemplified in the following examples: for opposite the sum required to be reduced to decimals, will be found its decimals, and opposite every decimal part proposed, will be found its value, but if the exact decimal is not to be found in the Table, then take the next less, which will be fully sufficient.

- (1) What is the decimal of 7s. 9p?
- (2) What is the value of .4375 of a £, sterling?
- (3) What is the decimal of 15 seers, 8 chahtacks?
- (4) What is the value of .49567 of a cwt.?
- (5) What is the decimal of 15s. 9d?
- (6) What is the value of .59428 of a rupee?
- (7) What is the decimal of 2qrs. 21lbs. 8oz.?
- (8) What is the value of .7359 of a maund?

The End of the Compendium.

ERRATA.

- Page 35, Ex. 33, line 6, for how may years, read how many years, &c.
 -- 60, Ex. 5, line 2, for 1807 read 1808.
 -- 66, Ex. 3, for 3023 Rs. 13 As. 8 P. read 3023 Rs. 13 As. 2 P.
 -- 72, line 31, for 91 Sa. Rs. 13 As. 9 P. read 91 Sa. Rs. 13 As. 2 P.
 ibid. line 32, for 94 Sa. Rs. read 93 Sa. Rs. 15 As. 5 P.
 -- 73, line 33, for 97 Sa. Rs. 9 As. 3 P. read 97 Sa. Rs. 6 As. 7 P.
 -- 73, line 2, for 87 Sa. Rs. 8 As. read 96 Sa. Rs. 15 As. 9 P.
 ibid. line 3, for 94 Sa. Rs. 13 As. 6 P. read 95 Sa. Rs. 11 As. 2 P.
 --- line 4, for 94 Sa. Rs. read 93 Sa. Rs. 15 As. 5 P.
 --- line 5, for 97 Sa. Rs. 13 As. 0 P. read 97 Sa. Rs. 13 As. 4 P.
 --- line 6, for 91 Sa. Rs. 13 As. 9 P. read 91 Sa. Rs. 13 As. 2 P.
 -- Ex. 15, line 2, for $1\frac{1}{2}$ per cent, read $1\frac{1}{2}$ per cent.
 1, line the last, read In 1000 Lucknow Rs. &c.
 Ex. 5, read In Mochedab Rs. &c.
 ibid. Ex. 7, substitute Mooney Sourtie for Patna Sourt.
 -- 80, Ex. 4, line 1, for 143 read 225.
 82, Ex. 2, line 2, for chunk, read chunk.
 83, Ex. 2, for 2313 B. Mds. 12 Srs. 14 cks. read 2313 B. Mds. 12 Srs.
 7 $\frac{3}{4}$ lbs. of Cotton, &c.
 84, Ex. 4, for July the 24th, read July the 25th.
 87, Ex. 2, line 2, for 1000 read 10,000.
 Ex. 3, line 3, for 4800 Rs. read 48,000 Rs.
 90, Ex. 6, lines 1 and 4 for Pie read Pie.
 100, Ex. 9, lines 1 and 4 for Pie read Pie.
 103, line 2, for One, read 1.
 105, Case 2, Ex. 2, for Pie read Pie.
 107, Ex. 16, for read .
 108, Ex. 7, for 6 Yds. 0 Cub. 9 In. read 6 Yds. 0 Cub. 9 In. $\frac{4}{12}$.
 115, Ex. 5, line 1, for 28 $\frac{1}{2}$ Rs. read 20 $\frac{3}{4}$ Rs.
 121, line 6, for $\frac{5}{8}$, read $\frac{7}{8}$, and line 8, for 5000 read 5,000, also in
 line 15 of this page, for 0300000 read 0000000.
 -- 128, in Addition and Subtraction of Decimals Ex. 3, for 5 lb. read 5 lb.
 -- 129, Ex. 11, read 16 1 R.
 -- 130, line 1, read 6 5 As.
 -- 150, Ex. 5, line 7, leave out 6.
 -- 143, Ex. 9, line 4, for horse, read house.
 -- 154, line 2, for 8334 &c. read 83194 &c.
 ibid. line 16 add 15.
 -- 154, line 7, for last read first.
 -- 227, Ex. 4, for 70,000, read 70000, and in the answer for A. Rs. 64848
 -- 13 read A. R. 64848 = 12
 -- 239, line 22, for 2 = 11 d. read 1 s. 11 d.
 -- 240, line 1, column 26, from the left, for 14 Srs. read 15 Srs.

